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DUE TO THE QUALITY OF THE ORIGINAL

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX

IN THE MATTER OF:	)
Beckman Instruments, Inc. Respondent	)
Proceeding Under Sections 104(a), 106(a) and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. §§ 9604(a), 9606(a), 9622), as amended by the Superfund Amendments and Reauthorization Act of 1986.	)

ADMINISTRATIVE ORDER
ON CONSENT

Docket No. 89-02

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Table of Content

I. JURISDICTION

This Consent Order is entered into pursuant to the authority vested in the President of the United States by Sections 104(a), 122(a) and (d)(3) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (hereinafter referred to as ("CERCLA"), 42 U.S.C. §§ 9604(a), 9622(a) and (d)(3), as amended by the Superfund Amendments and Reauthorization Act of 1986 (hereinafter referred to as "SARA"), Pub. L. No. 99-499, 100 Stat. 1613 (1986), and delegated to the Administrator of the United States Environmental Protection Agency (hereinafter referred to as "EPA") on January 23, 1987, by Executive Order 12580, 52 Fed. Reg. 2923, and further delegated to the Assistant Administrator for Solid Waste and Emergency Response and the Regional Administrators by EPA Delegation 14-8-A, 14-14-C, and redelegated to the Director, Toxics and Waste Management Division, EPA, Region IX. Notice of this Order has been given to the State of Arizona.

Beckman and EPA have entered into this Order in order to facilitate the ongoing investigation of groundwater conditions in the Indian Bend Wash ("IBW") area. Nothing in this Order is intended as or should be construed to be an admission of any issue of fact or law by Beckman.

Beckman agrees to undertake all actions required by the terms and conditions of this Consent Order. Beckman consents to and will not contest EPA jurisdiction regarding this Consent Order.

II. STATEMENT OF PURPOSE

In entering into this Consent Order, the mutual objectives of EPA and Beckman are to take further action as a part of the Remedial Investigation/ Feasibility Study ("RI/FS") to gather data to determine the nature and extent of the hazardous substances in groundwater in the North Indian Bend Wash site ("Site").

The activities conducted pursuant to this Consent Order are subject to review by EPA and, if performed in full accordance with the requirements set forth herein and all applicable EPA guidance and policies, shall be deemed consistent with the National Contingency Plan, 40 C.F.R. Part 300.68 (a)-(j) (47 Fed. Reg. 31180 (July 16, 1982), revised at 48 Fed. Reg. 40658 (September 8, 1983)), and revisions made thereto, pursuant to the provisions of 42 U.S.C. § 9605(b).

III. BACKGROUND

1. The information gathered in Phase I of the IBW remedial investigation indicated that groundwater in each of the three stratigraphic units present in the Indian Bend Wash area contain certain volatile organic compounds which are typically associated with industrial solvents. The principal contaminants located in the monitoring wells in the area are trichloroethylene (TCE), 1,1,1-trichloroethane (TCA), tetrachlorethylene (PCE), 1,1-dichloroethene (DCE) and small quantities of chloroform (CFM). TCE is the most abundant and widespread contaminant found in Phase I. TCE contamination was found in numerous wells, as illustrated in the EPA Phase I Task Report. (Ecology & Environment

1986).

2. Phase II of the Remedial Investigation at the Indian Bend Wash site is divided into two stages. The first stage ("Stage I") of this work included soil gas sampling, spinner logging and depth-specific water quality sampling of existing production wells, long-term pumping tests, data evaluation and analysis, and continuation of the ongoing monitoring activities. Stage I activities were largely of an information-gathering and assessment nature which are being used in the efficient location of additional monitoring wells in Stage II. Stage II activities consist of the installation of 17 additional groundwater monitoring wells in the Indian Bend Wash area. Beckman's participation in Stage II of Phase II is the subject of this Order.

IV. DETERMINATIONS AND FINDINGS

EPA has made the following Determinations and Findings:

1. Beckman Instrument Inc. was the operator of a facility, as defined in Section 101(9) of CERCLA, 42 U.S.C. § 9601(9), and as the term is used in Sections 104(a) and 122(a) of CERCLA, 42 U.S.C. §§ 6904(a), 6922(a).

2. Beckman is a person, as defined in Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

3. Wastes and constituents thereof generated by Beckman are "hazardous substances," as defined in Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

4. The past, present, and potential migrations of hazardous substances in the Indian Bend Wash site may constitute actual and threatened "releases," as defined in Section 101(22) of CERCLA,

42 U.S.C. § 9601(22).

5. Beckman is a potentially responsible party pursuant to Section § 107(a) of CERCLA, 42 U.S.C. § 9607(a).

6. There have been actual and threatened releases of hazardous substances from the Site to the environment.

7. Beckman has retained a suitable contractor, and is therefore qualified to properly conduct portions of the RI/FS.

8. The actions required by this Consent Order protect the public health and welfare and the environment.

V. WORK TO BE PERFORMED

All work performed pursuant to this Consent Order shall be under the direction and supervision of a qualified contractor with expertise in investigation, analysis and remedy of hazardous waste problems. Beckman has notified EPA that their contractor for this project shall be The Mark Group, Engineers & Geologists, Inc. ("MARK"). Beckman shall notify EPA in writing of the name, title, and qualifications of any replacement or additional contractors and/or subcontractors to be used in carrying out the terms of this Consent Order. EPA will contract with a qualified person to oversee and review the conduct of the RI/FS work.

Based on the foregoing, it is hereby AGREED TO AND ORDERED that the following work shall be performed:

1. Beckman shall perform the tasks and submit reports identified in Attachment A. This work shall be performed in accordance with the requirements of the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300, EPA RI/FS guidances (including "Guidance on Remedial Inves-

tigations under CERCLA," June 1985 and "Guidance on Feasibility Studies under CERCLA," June 1985) and with the standards, specifications and schedules contained in the IBW RI/FS QAPP and this Consent Order.

2. Any reports, plans, specifications, schedules and attachments required by this Consent Order are, upon approval by EPA, incorporated into this Order. Any non-compliance with such EPA approved reports, plans, specifications, schedules and attachments, unless otherwise excused by EPA in writing, shall be considered a failure to achieve the requirements of this Consent Order and will subject Beckman to the provision of Section XIII (Stipulated Penalties) of this Consent Order.

3. Beckman agrees to install one groundwater monitoring well in the Indian Bend Wash site as part of Phase II/Stage II of the RI/FS. This well shall be located at site O, as identified in Attachment B attached hereto and incorporated herein, and shall be known as EPA-6UA ("the Well"). The Well shall be installed in accordance with the Sampling and Analysis Plan (SAP) attached as Attachment C.

4. Beckman shall collect and analyze the first sample from the Well for all priority pollutants, excluding pesticides, including cations and anions, specific electrical conductance, temperature and pH. Subsequent samples will be collected on a quarterly basis until the first to occur of December 31, 1991 or the issuance of the Record of Decision for the Site.

If the results from the initial sampling effort indicate only contamination of the groundwater by volatile organic compounds

(VOCs), then the subsequent quarterly samples will be analyzed by EPA method 601. The Well will be sampled for anions and cations on an annual basis.

5. Samples collected during the first round of sampling the Well will be analyzed and results transmitted to EPA within two weeks of sampling the Well if the levels of any contaminant is equal to, or greater than, the primary drinking water standard. Results of subsequent sampling of the Well will be analyzed and transmitted to EPA within 60 days of sampling the Well.

6. Beckman shall make available to EPA, upon request, a split sample of all samples taken by Beckman or its authorized representatives. Beckman or its contractors have the right to request and receive split samples from any monitoring Well sampled by EPA and its contractors as part of Phase I or Phase II of the RI/FS. The identification and maintenance of all split samples shall be in accordance with the Quality Assurance Project Plan ("QAPP") entitled "Quality Assurance Project Plan, Indian Bend Wash and Phoenix-Litchfield Airport Area Site, Phoenix Arizona," November, 1984 which is incorporated by reference.

7. Documents, including reports, approvals, disapprovals, and other correspondence, to be submitted pursuant to this Consent Order, shall be sent by overnight mail to the following addresses or to such other addresses as the Beckman or EPA hereafter may designate in writing:

a. Documents to be submitted to EPA under the terms of this Consent Order should be distributed as follows:

(i) One copy of all document types to be sent via

overnight mail to:

Jeffrey Rosenbloom, (T-4-2)
Superfund Enforcement Section
US EPA, Region IX,
215 Fremont Street
San Francisco, CA 94105

cc: Robert W. Bergstrom, Esq.
Office of Regional Counsel
U.S. Environmental Protection Agency
215 Fremont Street
San Francisco, CA 94105

b. All notices and determinations required by this Order shall also be sent to:

Joseph Palmerino
Beckman Instruments, Inc.
2500 Harbor Boulevard
Fullerton, CA 92634

cc: Bryant C. Danner, Esq.
Latham & Watkins
555 S. Flower Street
Los Angeles, CA 90071

VI. SUBMITTAL SCHEDULES

Beckman shall begin the Well installation program within thirty (30) calendar days of the effective day of this Consent Order. Beckman shall use its best efforts to complete installation of the Well within forty five (45) calendar days of the effective date of this Order, but shall complete the installation of the Well within sixty (60) calendar days of the effective date of this Order. Beckman shall submit a completion report setting forth the detailed data on the Well construction and the results of the first sampling round from the Well within sixty (60) calendar days after completion of installation of the Well.

VII. DESIGNATED PROJECT COORDINATORS

1. On or before the effective date of this Consent Order, EPA and Beckman shall each designate a Project Coordinator. Each Project Coordinator shall be responsible for overseeing the implementation of this Consent Order. The EPA Project Coordinator will be EPA's designated representative at the Site. To the maximum extent possible, communications between Beckman and EPA shall be directed through the Project Coordinators.

2. EPA's Project Coordinator will be:

Jeffrey S. Rosenbloom, T-4-2
Remedial Project Manager
U.S. Environmental Protection Agency
215 Fremont St., San Francisco, CA 94105

Beckman's Project Coordinator will be:

Joseph Palmerino
2500 Harbor Blvd.
Fullerton, CA 92634

3. EPA and Beckman each have the right to change their respective Project Coordinator. Such a change shall not be effective until the other party has been notified in writing.

4. The EPA Project Coordinator shall also have the authority vested in the On-Scene-Coordinator ("OSC") by the NCP, unless the EPA designates a separate individual as OSC.

5. The absence of the EPA Project Coordinator or OSC from the Site shall not be cause for the stoppage of work.

VIII. QUALITY ASSURANCE

All field work conducted by Beckman or its contractors pursuant to this Order shall be conducted in accordance with the approved QAPP. Beckman or its contractor will notify the EPA

Project Coordinator within fourteen (14) calendar days of the intent to sample Well O, and indicate which EPA method or methods of analysis will be used.

IX. SITE ACCESS

Attachment E is the confirmation by the City of Scottsdale that Beckman has all the necessary authorities and permissions to drill the well at the location specified in Attachment B, and that EPA and its authorized representatives also are entitled to access to the Site.

All parties with site access during the implementation of this Consent Order shall comply with the MARK Health & Safety Plan.

Beckman assumes full responsibility for any claims arising from the activities conducted by Beckman or its representatives or consultants on third-party property in connection with this Consent Order.

X. SAMPLING, ACCESS, AND DATA/DOCUMENT AVAILABILITY

Beckman shall make available to EPA the results of all sampling and/or tests or other data generated by Beckman, or on Beckman's behalf, with respect to the implementation of this Consent Order.

Under the provisions of §104 (e) of CERCLA and this Consent Order, EPA explicitly reserves the right to observe the work to be conducted by Beckman, as it is performed. In addition, at the request of EPA, Beckman shall allow split or duplicate samples to be taken by EPA and/or its authorized representatives, of any samples collected by Beckman pursuant to the implementation of

this Consent Order.

Beckman agrees to provide all data and information relating to the construction, geophysical/hydrogeological condition, and contaminant levels of the Well. Specifically, this data includes: raw analytical data, monitoring data, sampling data, geophysical data, hydrogeological data, and geologic data.

Beckman shall notify EPA in a timely manner of any project that is likely to produce data or information of the types described in this section pertaining to the Well.

Beckman recognizes that the data and reports provided to EPA under this Consent Order are not subject to the protection of Section 1905 of Title 18 and 40 C.F.R. Part 2 as confidential business information, in accordance with the provisions of CERCLA §104(e)(7)(F), 42 U.S.C. §9604(e).

XI. RECORD PRESERVATION

Despite any document retention policy to the contrary, Beckman agrees to preserve, for a minimum of six (6) years after the date of issuance of the Record of Decision for the Site, all drilling specifications, contractor invoices, and raw analytical/geophysical/lithological data relating to the Well. After this six year period, Beckman shall notify EPA within sixty calendar days prior to the destruction of any such documents. Upon request by EPA, Beckman shall make available to EPA such records or copies of any such records. Additionally, if EPA requests that some or all of such documents be preserved for a longer period of time, Beckman agrees to comply with that request or, at Beckman's option, transfer custody of such documents to

EPA. EPA agrees that by virtue of Beckman's disclosure of documents as required under this paragraph, Beckman has not waived its right to assert whatever privileges it may have with respect to other reports, documents, or data.

XII. PROPOSED CHANGES AND DISPUTE RESOLUTION

Neither party may propose changing the scope of this Consent Order beyond the installation of a single ground water monitoring Well. However, EPA or Beckman may propose a change in the conditions of this Order. In this event, or if Beckman raises a good faith objection to any EPA notice of disapproval, noncompliance or decision made by EPA pursuant to this Consent Order, there shall be an opportunity for a meeting of the parties. There shall also be an opportunity for submission of written materials prior to, and at, such meeting for the purpose of considering any proposed changes, and adopting any necessary amendments to this Consent Order. If Beckman so objects to an EPA decision, it shall orally notify EPA immediately, and shall subsequently notify EPA in writing within fourteen (14) days of receipt of the decision. EPA and Beckman then have an additional fourteen (14) days from the receipt by EPA of the notification of objection to meet and reach agreement. This period may be extended by mutual agreement between EPA and Beckman.

If agreement cannot be reached on the disputed issue within this fourteen (14) day period, EPA shall provide a written statement of its decision to Beckman. If agreement is reached, Beckman shall implement the directives contained in such decision. If agreement on any technical issue cannot be reached, upon

agreement of the parties, either party may submit the issue to the IBW Committee for resolution, subject to final EPA approval. After a final decision is made, either by EPA or the IBW Committee, Beckman shall implement the decision. If Beckman should refuse to implement such directives, EPA may elect to perform such work, subject to the provisions of Sections XV and XIII, infra.

If the dispute is not resolved by the procedures outlined above, either party may exercise such other administrative or legal remedies as are available under applicable laws and regulations. The filing of any administrative or legal action pursuant to this article shall not stay or otherwise delay the performance of any tasks in this Consent Order which are not specifically the subject of the dispute.

The imposition or amount of Stipulated Penalties shall not be subject to Dispute Resolution.

XIII. STIPULATED PENALTIES

Pursuant to 42 U.S.C. §§9622(e) and 9609, the parties agree that stipulated penalties shall be paid by Beckman for any failure to comply with the requirements of this Consent Order, including untimely or inadequate submittals or work required under the terms of this Consent Order.

Beckman shall pay the sum set forth below as stipulated penalties into the Hazardous Substance Response Trust Fund within 30 days of notification that stipulated penalties have been triggered.

Beckman shall pay the following sums for failure to comply

with Sections V.3, V.4, V.5 and VI above:

Day of Violation	Penalty Per Day
0-7	$ 5,000
7-14	10,000
14-31	15,000
31 and beyond	25,000

Beckman shall pay the following sums for failure to comply with all other requirements of this Consent Order:

Day of Violation	Penalty Per Day
0-7	$ 1,000
7-14	2,000
14-31	3,000
31 and beyond	5,000

The penalties for failure to submit a deliverable or to otherwise comply with the requirements of this Consent Order shall commence upon the receipt of a notice of inadequacy from EPA, which shall set forth the deficiencies of the deliverable or performance or nonperformance by Beckman and the class of penalties that is being assessed. These penalties shall accrue until receipt by EPA of the late deliverable, or of the revised deliverable which cures the deficiencies or performance by Beckman of the identified tasks in accordance with the requirements of this Consent Order.

Penalties shall accrue during a dispute under the provisions of Section XII, supra, but will not be demanded during this period. If Beckman loses upon final resolution, however, Beckman shall pay all penalties which accrued prior to and during the

period of dispute.

Neither the invocation of the Dispute Resolution measures nor the payment of the penalties alter Beckman's obligations to complete performance under this Consent Order. The stipulated penalties set forth in this Section do not preclude EPA from electing to pursue any other remedies or sanctions which may be available to EPA by reason of the Beckman's failure to comply with any of the requirements of this Consent Order, including an action in District Court to enforce the provisions of this Consent Order, statutory penalties as authorized by Sections 104, 106, and 109, of CERCLA, a federally-funded response action, and a suit for reimbursement of costs incurred by the United States and the State of Arizona.

In the event EPA makes such an election, however, and initiates an action for administrative or judicial relief seeking monetary penalties for violations of this Consent Order, EPA will not seek the penalties provided for under this Section for the specific violation of this Consent Order. However, if EPA assesses stipulated penalties for a failure to comply with the terms of this Consent Order, this paragraph specifically shall not preclude EPA from simultaneously seeking non-monetary relief.

Failure to pay a stipulated penalty on time is an additional violation of the Order subject to stipulated penalties.

In the event the United States assumes the performance of a portion or all of the work to be performed under this Order, pursuant to Section XV (Reservation of Rights) because of Beckman's failure to comply with its obligations under this Order, Beckman

shall be liable for stipulated penalties pursuant to this Section.

Checks for stipulated penalties assessed under this Consent order should be addressed to:

U.S. Environmental Protection Agency
Superfund Accounting
P.O. Box 371003M
Pittsburgh, PA 15251

A copy of the check and the letter forwarding the check should also be sent to the EPA Project Coordinator.

XIV. FORCE MAJEURE

If any event occurs which causes delay in the achievement of the requirements of this Consent Order, Beckman shall bear the burden of demonstrating by clear and convincing evidence that the delay was caused by circumstances beyond the control of Beckman or its contractor and could not have been overcome by Beckman's best efforts. Beckman shall promptly notify EPA's Project Coordinator orally and shall, within seven (7) calendar days of oral notification to EPA, notify EPA in writing of the anticipated length and cause of the delay, which of the tasks are directly affected by the delay, the measures taken and/or to be taken to prevent or minimize the delay, and the timetable by which the Beckman intends to implement these measures. Failure of Beckman to comply with these notice requirements will constitute a waiver of any claim of Force Majeure. Beckman shall adopt all reasonable measures to avoid or minimize any delay caused by a Force Majeure.

If EPA determines that the delay or anticipated delay has

been or will be caused by circumstances beyond the control of the Beckman, the time for performance shall be extended for a period equal to the delay resulting from such circumstances. Delays greater than those equal to the delay will be considered by EPA under Dispute Resolution, Section XII.

If EPA determines that the delay was not beyond the control of Beckman, this delay shall constitute non-compliance with the Consent Order, and penalties shall accrue from the time of non-compliance.

Increased costs of performance of the terms of this Order, changed economic circumstances, or failure to timely and adequately apply for any required approvals shall not be considered circumstances beyond the control of Beckman.

XV. RESERVATION OF RIGHTS

EPA and Beckman expressly reserve all rights and defenses that they may have under applicable law, including EPA's right both to disapprove of work performed by Beckman and to request that Beckman perform tasks in addition to those detailed in this Consent Order, pursuant to Section XII of this Consent Order (Proposed Changes and Dispute Resolution). If, pursuant to the procedures outlined in Section XII, supra, additional work is agreed upon by the parties, the additional work shall be completed in accordance with the standards, specifications, and schedule approved by EPA. The appropriate sections and attachments of this document shall be amended to include any additional work which is to be performed. EPA also reserves the right to conduct such additional tasks.

Beckman is not released from liability for any actions beyond the terms of this Consent Order. EPA reserves the right to take any enforcement action pursuant to CERCLA or any other legal authority, including the right to seek injunctive relief, monetary penalties and punitive damages, except as discussed above in Section XIII.

In the event that Beckman declines to perform any additional and/or modified tasks, EPA will have the right to undertake any Remedial Investigation and/or Feasibility Study work to the extent EPA has such rights under CERCLA and the NCP. In addition, EPA reserves the right to undertake removal actions and/or remedial actions at any time to the extent EPA has such rights under CERCLA, the NCP and applicable law. In either event, EPA reserves the right to seek reimbursement from Beckman for any response costs incurred by the United States or the State of Arizona pursuant to Section 107 of CERCLA and any other applicable law, to the extent such recovery is consistent with CERCLA, the NCP and such other applicable law.

EPA agrees that, if performed in full accordance with the requirements set forth herein, the work designated to be performed by Beckman under this Order is consistent with the National Contingency Plan, 40 C.F.R. Part 300, promulgated by EPA pursuant to Section 105 of CERCLA.

In the event that EPA initiates an action pursuant to Section 106 or 107 of CERCLA against any person, and Beckman is or becomes a party in the action from whom a response cost is sought, Beckman and EPA shall suggest to the court that the work

performed by Beckman in accordance with the provisions of this Consent Order be considered satisfactory in determining the amount, if any, of Beckman's liability for response or remedial costs in the Indian Bend Wash area.

By entering into this Consent Order, Beckman does not admit the accuracy of any determination or finding made herein by EPA, any liability under any Federal or State statute for response costs at the IBW Site, or for any other liability relating to the IBW site or Beckman's operation at its former plant in the IBW area.

XVI. REIMBURSEMENT OF OVERSIGHT COSTS

Under the provisions of Section 104(a) of CERCLA, as amended, Beckman shall reimburse the Hazardous Substances Superfund for EPA oversight costs incurred by EPA with respect to this Order to the extent required by applicable law. No more than annually, EPA shall submit to Beckman an accounting of all costs incurred by the U.S. Government to oversee and review the work performed by Beckman under this Consent Order. These oversight costs include, but are not limited to, time and travel costs of EPA employees, agents and contractors, compliance monitoring in the field, analysis of samples, review of deliverables submitted by Beckman, and tracking of Beckman's compliance with the terms of the Consent Order. Beckman shall, within 30 calendar days of receipt of that accounting, remit a check for the amount of those costs, made payable to the Hazardous Substances Superfund. Checks should specifically reference the Indian Bend Wash site, and be addressed to:

U.S. Environmental Protection Agency
Superfund Accounting
P.O. Box 37100 3M
Pittsburgh, PA 15251,

A copy of the transmittal letter and a copy of the check should be sent to the EPA Project Coordinator.

XVII. OTHER CLAIMS

Nothing in this Consent Order shall constitute or be construed as a release from any claim, cause of action or demand in law or equity against any person, firm, partnership, or corporation not a signatory to this Consent Order for any liability it may have arising out of or relating in any way to the generation, storage, treatment, handling, transportation, release, or disposal of any hazardous substances, hazardous wastes, pollutants, or contaminants found at the Site.

Nothing in this Consent Order constitutes a preauthorization of funds under Section 111(a)(2) of CERCLA. In light of this Consent Order, Beckman waives its right to make a claim against the Superfund under Section 106(b)(2) for the costs of the work to be performed under this Consent Order, except for any changes which Beckman undertakes pursuant to Section XII.

XVIII. OTHER APPLICABLE LAWS

All actions required to be taken pursuant to this Consent Order shall be undertaken in accordance with the requirements of all applicable local, state, and federal environmental laws, regulations, and in accordance with substantive permitting requirements, to the extent required by §121(e) of CERCLA and the National Contingency Plan ("NCP"), 40 C.F.R §300.68(a)(3).

Beckman's obligation to install and sample monitoring Well O

and perform pump tests under the provisions of this Order is conditioned upon the determination by EPA that an NPDES permit is not required for such work, pursuant to the NCP. However, Beckman shall comply with all substantive requirements of any applicable permit.

XIX. INDEMNIFICATION OF THE UNITED STATES GOVERNMENT

Beckman agrees to indemnify and save and hold the United States Government, its agencies, departments, agents, and employees, and contractors, harmless from any and all claims or causes of action arising from or on account of acts or omissions of Beckman, its officers, employees, receivers, trustees, agents, contractors, or assigns, in carrying out the activities pursuant to this Consent Order. The United States Government or any other agency thereof is not a party in any contract entered into by Beckman or its consultants in carrying out activities at the Site pursuant to this Consent Order.

XX. EFFECTIVE DATE AND SUBSEQUENT MODIFICATION

In consideration of the communications between Beckman and EPA prior to the issuance of this Consent Order concerning its terms, Beckman agrees that there is no need for a settlement conference with respect to the entry of this Consent Order prior to the effective date hereof. Therefore, the effective date of this Consent Order shall be the date on which it is signed by EPA.

This Consent Order may be amended by mutual agreement of EPA and Beckman. Such amendments shall be in writing and shall have be effective on the date on which such amendments are signed by EPA.

Any reports, plans, specifications, schedules, and attachments required of Beckman under this Consent Order are, upon approval by EPA, incorporated into this Consent Order. Any noncompliance with such EPA approved reports, plans, specifications, schedules, and attachments shall be considered a failure to achieve the requirements of this Consent Order and will subject Beckman to the provisions included in the "Stipulated Penalties" (Section XIII) of this Consent Order.

No informal advice, guidance, suggestions, or comments by EPA regarding reports, plans, specifications, schedules, and any other writing submitted by Beckman will be construed as relieving Beckman of its obligation to obtain such formal approval as may be required by this Consent Order.

XXI. PARTIES BOUND

This Consent Order shall apply to and be binding upon Beckman, its agents, successors, assigns and (with the exception of Section XIII) all persons, contractors, and consultants acting under or for Beckman.

No change in ownership or corporate status relating to Beckman will in any way alter Beckman's responsibility under this Consent Order. Beckman will be responsible, and will remain responsible for carrying out all activities required of Beckman under this Consent Order.

XXII. NOTICE TO THE STATE

EPA has notified the State of Arizona pursuant to the requirements of Section 106(a) of CERCLA.

XXIII. SATISFACTION

The provisions of this Consent Order shall be deemed satisfied upon Beckman's receipt of written notice from EPA that Beckman has demonstrated, to the satisfaction of EPA, that all of the terms of this Consent Order have been completed.

XXIV. REPRESENTATIVE AUTHORITY

Each undersigned representative of the parties to this Consent Order certifies that he or she is fully authorized to enter into and to legally bind such party to this document.

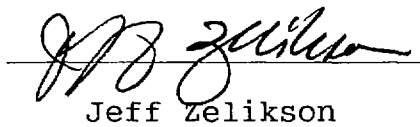
IT IS SO AGREED AND ORDERED:

BY: William G. Newton Date: 8 Dec. 1988

William G. Newton
Vice President

Beckman Instruments, Inc.

BY:



Date: 12-22-88

Jeff Zelikson

Director

Toxics & Waste Management Division

U.S. Environmental Protection Agency

Effective Date:

12-22-88

ATTACHMENT A

ATTACHMENT A

REPORTS, PLANS, AND TASKS UNDER THIS CONSENT ORDER

1. Sample and Analysis Plan (Attachment C) that includes:

   - o Well design and drilling specifications;
   - o Well installation procedure;
   - o Lithologic methods;
   - o Sampling protocol;
   - o Blanks, duplicates, replicates;
   - o Suite of analysis;
   - o Analytical methods;

2. Install well in accordance to specifications in SAP (Attachment C)

3. Sample well for the following constituents for the first sampling event:

   - o All priority pollutants excluding pesticides;
   - o Cations and anions;
   - o Specific electrical conductance;
   - o Temperature;
   - o pH.

   Subsequent samples taken on a quarterly basis until December 31, 1991 or the issuance of the Record of Decision for the North IBW site will be sampled for volatile organic constituents using EPA Method 601 and also sampled annually for anions and cations.

4. Prepare and submit Completion Report

   This report shall include the following:

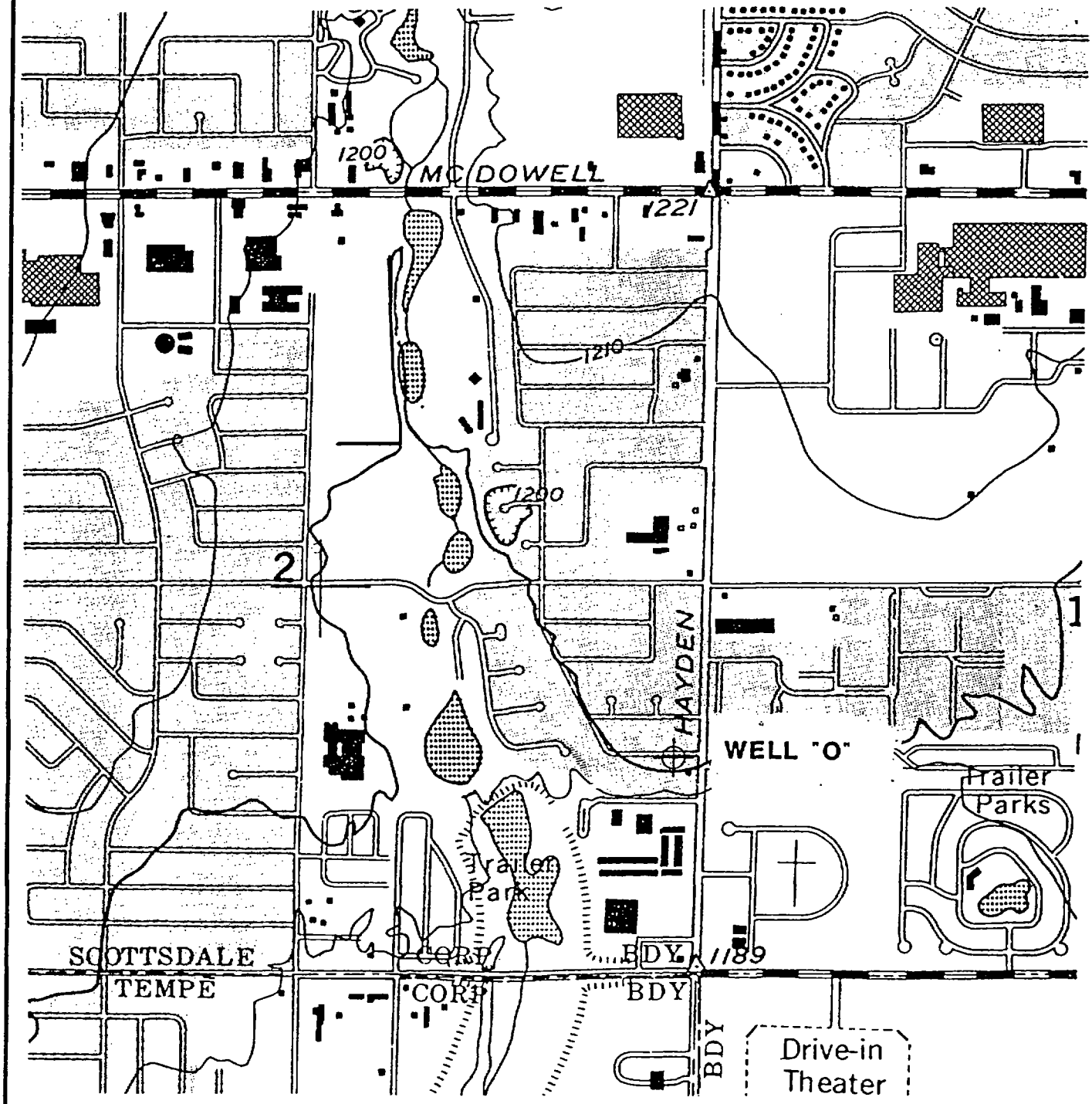
   - o As-built drawing of well;
   - o Lithologic log;
   - o Geophysical logs (caliper, SP, resistivity, single point, (16-inch, 64-inch) and natural gamma;
   - o Result of short-term aquifer test
   - o Results of first sampling round

5. Submit sample results to EPA

   Sample results shall be submitted to EPA as called for in the Consent Order.

ATTACHMENT B

Prepared By SJN Approved By RFK Date 11/2/88



SCALE

1 INCH EQUALS APPROXIMATLY 1000 FEET

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

LOCATION OF WELL "O"

PROJECT NO.
84-2101.6

DRAWING NO.
1

Attachment C

Sampling and Analysis Plan (SAP) for Beckman Instruments, Inc.

84-2101.6

November 2, 1988

The MARK Group
Engineers & Geologists, Inc.
2300 Paseo Del Prado, D-108
Las Vegas, Nevada 89102

TABLE OF CONTENTS

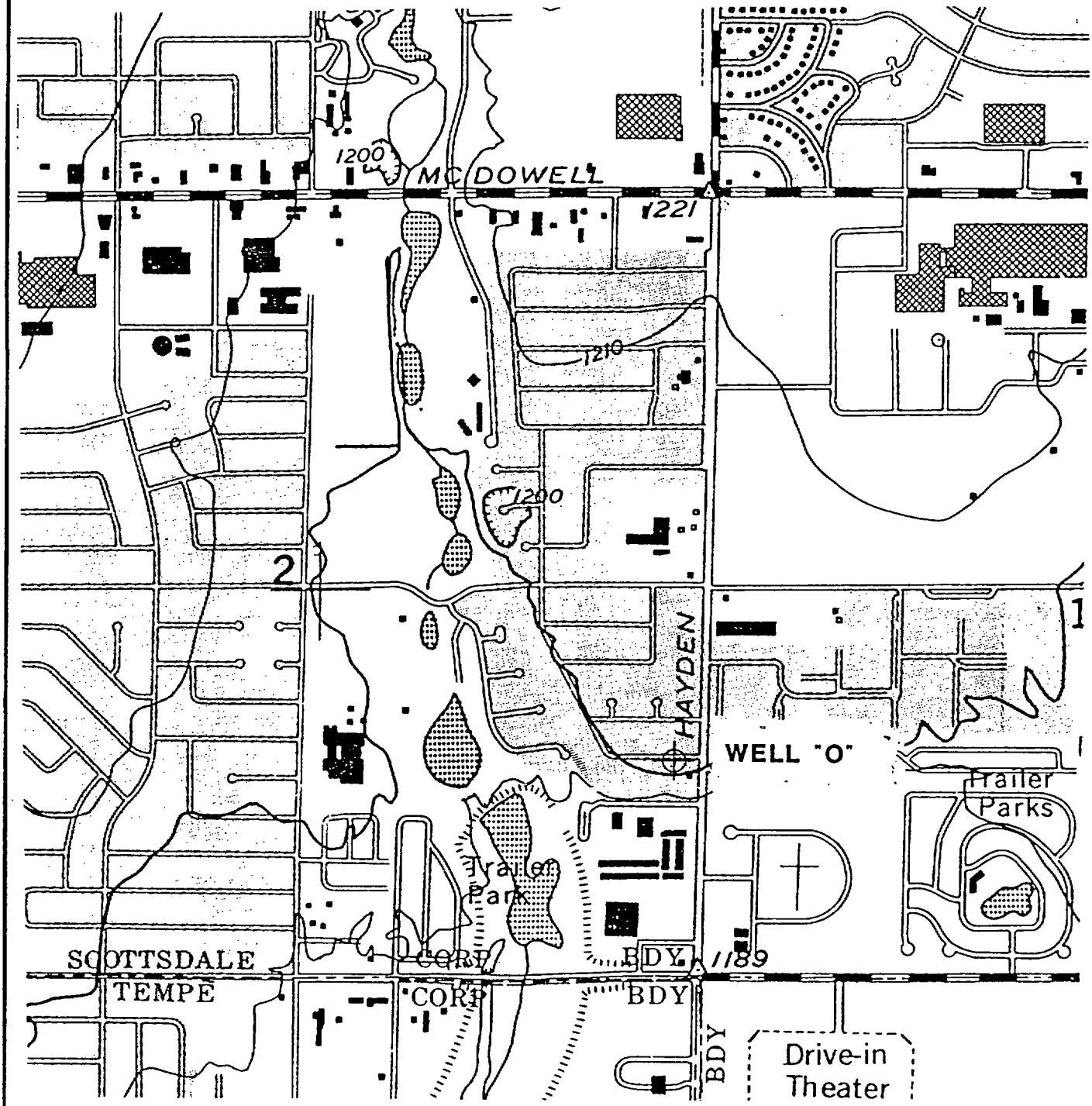
LIST OF FIGURES

LIST OF TABLES

Section 1 - INTRODUCTION

This Sampling and Analysis Plan describes the drilling and sampling methodology to be used in installing Monitoring Well O. Well O is located 150 feet west of the intersection of Hayden and Kimsey Roads on Kimsey, Scottsdale, Arizona (Drawing 1).

Prepared By SJN Approved By RFK Date 11/2/88



SCALE

1 INCH EQUALS APPROXIMATLY 1000 FEET

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

LOCATION OF WELL "O"

PROJECT NO.
84-2101.6

DRAWING NO
1

SECTION 2

WELL DESIGN AND DRILLING SPECIFICATIONS

2.1 Scope

This section provides information on the drilling, construction, and testing of one ground water monitoring well (Well "0"). The objective of this work is to provide additional information to characterize site conditions for a portion of the Indian Bend Wash project area.

2.2 Mobilization and Demobilization

Mobilization and demobilization includes supplying temporary fencing, moving onto and off the site all materials and equipment for drilling, constructing, developing, completing and pump testing the monitoring well described herein. It also includes restoration of the site upon completion of the scope of work. All equipment and materials must be approved by MARK and be on-site prior to initiation of drilling.

2.3 Equipment, Methods and Materials

The equipment and materials required for the construction of the monitoring well shall be in accordance with the following requirements:

2.3.1 Drilling Fluid

Drilling fluids, if required, shall be only high-grade approved commercial clays, commercial clay products commonly used in the area for water well drilling, or approved drilling additives. No organic-based mud (such as Revert) are allowed. The drilling fluid shall possess such characteristics as are required to adequately maintain the walls of the borehole, to

prevent caving of the walls as drilling progresses, and to permit recovery of representative samples of drill cuttings. The CONTRACTOR shall remove any residual mud cake on the borehole wall during development of the well. Analysis of all proposed drilling additives for volatile organic compounds (EPA Method 601) is required. MARK will take a representative sample of the mud for analysis.

Equipment for measuring fluid properties, particularly viscosity and weight, shall be supplied by CONTRACTOR and be available at the rig site during all drilling periods. Measurement of viscosity and solid content will be made by the CONTRACTOR either hourly, at 20-foot intervals, or as directed by the MARK representative. The choice of the drilling fluid and any and all additives thereto will be subjected to approval by MARK prior to actual use of such fluid or additives.

2.3.2 Well Casing

All well casings to be used hereunder as part of the permanent well shall be new, straight, and free of any internal or external protrusions.

2.3.2.1 Outer Casing

Nominal 6-inch steel casing with wall thickness at least 1/4-inch will be installed to the approximate depth indicated on Figure 2. The casing sections will have squared ends suitable for butt-welding without misalignment. They shall conform to ASTM A-53 Grade B or A139 Grade B steel requirements or equivalent.

2.3.2.2 Inner Casing

Steel casing shall be 4-inch Schedule 20 steel pipe with welded joints.

2.3.2.3 Slotted Casing

Slotted casing shall be 4-inch 0.250-inch steel pipe with welded joints, factory slotted with 1/8-inch by 3-inch sawcut slots, six slots per round, and two rows per foot with alternate rows staggered. A bottom cap to the casing shall be used. Centralizers shall be installed every 20 feet or as directed by MARK. Slot openings may be modified by MARK.

2.3.3 Grout Seal

Grout seal shall consist of a neat cement slurry composed of 6 gallons of water to each 94-pound sack of Type II portland cement with a water ratio of 14.5 to 15.0 pounds solids per gallon of water. The density of the slurry mixture shall be monitored prior to placement and in the return flow at land surface using a standard mud balance supplied by the CONTRACTOR. A record will be kept of all such measurements. The time between mixing and placement and the total volume of slurry emplaced shall also be recorded.

The seal shall begin from the top of the slotted casing to grade. A cement basket or rubber cement packer will be used to contain the grout above the slotted casing.

2.4 Construction of Well (Methods and Materials)

Well construction will substantially conform to the design shown in Drawings 2 through 5. However, the MARK on-site

Geologist or Engineer may make minor adjustments in the design of the well in the field.

2.4.1 Drilling Surface Hole

The borehole shall be drilled using air rotary techniques in the Upper Alluvium Unit unsaturated zone and, if possible, into the saturated zone. However, mud rotary can be used if air rotary is not possible. MARK, in consultation with the CONTRACTOR, will determine when mud rotary is to be used. Drilling muds can be used to stabilize the borehole after approval by MARK. Penetration rates per each 5 feet of drilling, measurements of drilling fluids lost to the aquifer, and depths at which these occur should be recorded at the time of occurrence by the drilling superintendent.

2.4.2 Setting Outer Casing

Drill and install 20 feet of conductor casing for the well as indicated in Drawing 2. Six-inch outer casing will be installed, and will extend from the bottom of the hole (approximately 20 feet) to 1 foot above ground level. The outer casing will be pressure-grouted into place. Cement will be installed through a grouting plug using a tremie pipe and positive displacement pump until it appears out of the annulus at the surface. Grouting should be carried out in one continuous operation and in the presence of the MARK representative. No further work shall be done on the well until the grout has firmly set. The adequate setting time may be determined by taking a sample of the grout placed at the end of the grouting procedure and placing this sample in a suitable open container (tin can), and then submerging the sample in a bucket of water for later

testing for strength when subjected to hand pressure. Standby time for grout cure will not be paid.

2.4.3 Drilling Continuation Hole

When the cement has hardened (approximately 24 hours after installation), drilling can continue to total depth (approximately 120 feet below land surface). A 6-inch diameter boring will be constructed.

2.5 Setting the Inner Blank and Slotted Casing

The inner casing assembly shall be properly laid out and measured on the ground which is to be covered by visqueen before installation. Component sections will be securely coupled at the threaded or welded joints as the casing string is installed. After the completely assembled casing string is lowered into the borehole, it should be supported at the top so that the entire assembly is under tension.

2.6 Drilling Log

As the drilling proceeds, the driller shall keep a log of the borehole which carefully and accurately describes the materials penetrated. The log shall show all changes in strata and such information as drilling rate, depth at which water is first encountered, and other pertinent phenomena observed during drilling of the borehole. A record shall be kept of any variation in the addition and amount of approved clays or chemical products or water required during drilling. The depth at which such changes are required shall be shown in the daily reports.

2.7 Sieve Analysis

MARK shall determine the grain size distribution of at least five samples. Data required from the sieve analyses are the cumulative percent retained by each sieve of a particular screen size opening.

2.8 Geophysical Logging

MARK is responsible for subcontracting a suite of geophysical logs from a depth of 20 feet to total depth. All logging will utilize a Compulog or other computer-based data acquisition system, so that raw data can be permanently stored on magnetic tapes. The driller shall be responsible for assisting the geophysical subcontractor and preparing the boring for logging by filling the hole with non-organic-based mud.

Logs to be conducted shall include:

A. Resistivity Logs: These will include 16-inch normal, 64-inch normal, and single-point resistivity logs.

B. Spontaneous Potential (SP) Logs

C. Natural Gamma Ray Log

D. Caliper

The borehole shall be logged through standing fluid from the base of the borehole to the surface, unless determined otherwise by MARK. Ground surface shall be designated as zero elevation.

2.9 Gravel Packing

No gravel pack shall be placed in the well.

2.10 Well Development

The development of the well shall consist of removing: (a) the native silts and clays deposited on the aquifer face during the drilling; and (b) the drilling mud (if used).

The completed well shall be developed by either pump surging, air lifting, or jetting techniques, depending on hole depth and physical conditions. Air for airlift development shall be filtered to remove hydrocarbons prior to use. During pump surging, a pump without a check valve shall be used such that a surging action can be achieved with backflowing water. Pumping or air lifting should be able to achieve 20 gpm from the slotted area. Development water may be discharged to the surface, storm drain, or sewer, as approved by MARK. Development shall continue for at least 4 hours. Additional time may be required for well development. When necessary, additional well development will be paid on an hourly basis according to the price schedule established for well development with CONTRACTOR. MARK will determine when discharge can be released to the surface and when proper development has been accomplished. Each well will be developed until the water clears.

The CONTRACTOR should provide his best professional estimates as to how many hours of development will be necessary to achieve the development objective stated above and to reflect this estimated in the bid. Payment for the development will be based on the unit price per hour shown on the bid schedule. It shall cover only those hours that the development tools and equipment are actually being operated.

2.11 Aquifer Test

Prior to the installation of permanent pumps, a short-term aquifer test shall be conducted at the well. Pumping rate shall be controlled with an appropriate valve and measured with an in-

line totalizing flowmeter. The CONTRACTOR shall supply, install, and operate a pump in order to perform a short-term (12 hours) aquifer and recovery test. The pump shall be capable of pumping 50 gallons per minute to the surface from the estimated level of the water in the aquifer. Water samples will be taken hourly for analysis of volatile organic compounds (EPA Method 601). If the pump fails during the test, the test shall be repeated at the CONTRACTOR's expense. Water levels must be allowed to recover before a second test is initiated. The CONTRACTOR shall provide piping to conduct all production waters to the proper disposal point as directed by MARK.

2.12 Pump Installation and Wellhead Finishing

A dedicated pump system, located as shown in Figure 2, will be installed in the well with components described as follows:

A 1/2 HP, 4-inch diameter submersible pump (Grundfos, 230V) will be set at an appropriate depth estimated to be 110 feet in Well "0". Pump installation will be such as to allow easy removal and/or adjustment of position. The pump will have a capacity to extract a minimum of 10 gpm at predicted total dynamic head of 85 feet, including friction losses.

2.12.1 Column Piping

Column piping shall be 1-inch Schedule 40 galvanized steel pipe. Joints shall be threaded coupling using Teflon tape.

2.12.2 Sounding Pipe

Sounding pipe shall be 3/4-inch diameter Schedule 40 galvanized steel pipe. Joints shall be threaded coupling using Teflon tape. Sounding pipe shall have 1/8-inch holes drilled every foot in the lower 10 feet.

2.13 General Clean-up and Decontamination of Personnel and Equipment

This section covers the labor, materials, and equipment necessary for general cleanup and decontamination of all personnel, sampling, and analysis equipment.

2.13.1 General Cleanup of Construction Area

Avoid contamination of the project area. Do not dump waste, oil, rubbish, or other materials on the ground. Restore site, as nearly as possible, to original condition as determined by the MARK Engineer or Geologist.

Upon completion and acceptance of the work at the site, remove from the site all equipment, unused materials, temporary facilities, and other miscellaneous items resulting from or used in the operations. Replace or repair any facility damaged during the work. Site cleanup shall be completed to the satisfaction of the MARK Geologist or Engineer.

Upon leaving the site at the completion of work, the CONTRACTOR shall clean and decontaminate the tools in accordance with Section 2.13.2, Decontamination. Contaminated solid and liquid waste from the final decontamination shall be disposed of as specified therein.

2.13.2 Decontamination

The Contractor shall follow the general decontamination plan, as specified by MARK in the Site Health and Safety Plan. Prior to mobilization, the Contractor will finalize all personnel decontamination needs, equipment, and procedures with MARK. If necessary, the Contractor shall supply a decontamination station

satisfying Level C requirements and equipped with a means of catching all water.

The Contractor shall provide all equipment necessary for decontamination such as trisodium phosphate, hot water, high pressure washer, buckets, brushes, etc.

Subcontractor shall provide United States Department of Transportation (U.S. DOT)-approved containers having a 55-gallon capacity and sealable, watertight lids as required. Labeling materials shall also be supplied by the Contractor.

All equipment shall be washed and cleaned as approved by the Geologist or Site Engineer prior to initiation of work at each well site. This includes drilling rigs, pipe, pumps, and any other equipment brought onsite. This is done to prevent cross-contamination between locations and contamination of any material being placed into the ground.

If the soil is discolored or other evidence such as from an organic vapor monitor (HNu, OVA, OVM, etc.) indicates contamination, the Contractor shall perform decontamination as required to protect personnel and prevent contamination of other areas. MARK is responsible for detecting contamination; however, MARK, in its sole discretion, may determine that a site is contaminated and direct the Contractor to take remedial steps. The minimum procedures to be taken are as follows:

An on-site decontamination pad and station will be supplied by the Contractor. The decontamination station will provide a place for the containment of all fluids used in the decontamination procedure.

All personnel shall be decontaminated before leaving the site if contamination is observed or measured by the MARK Geologist or Engineer, as specified in MARK's Site Safety Plan.

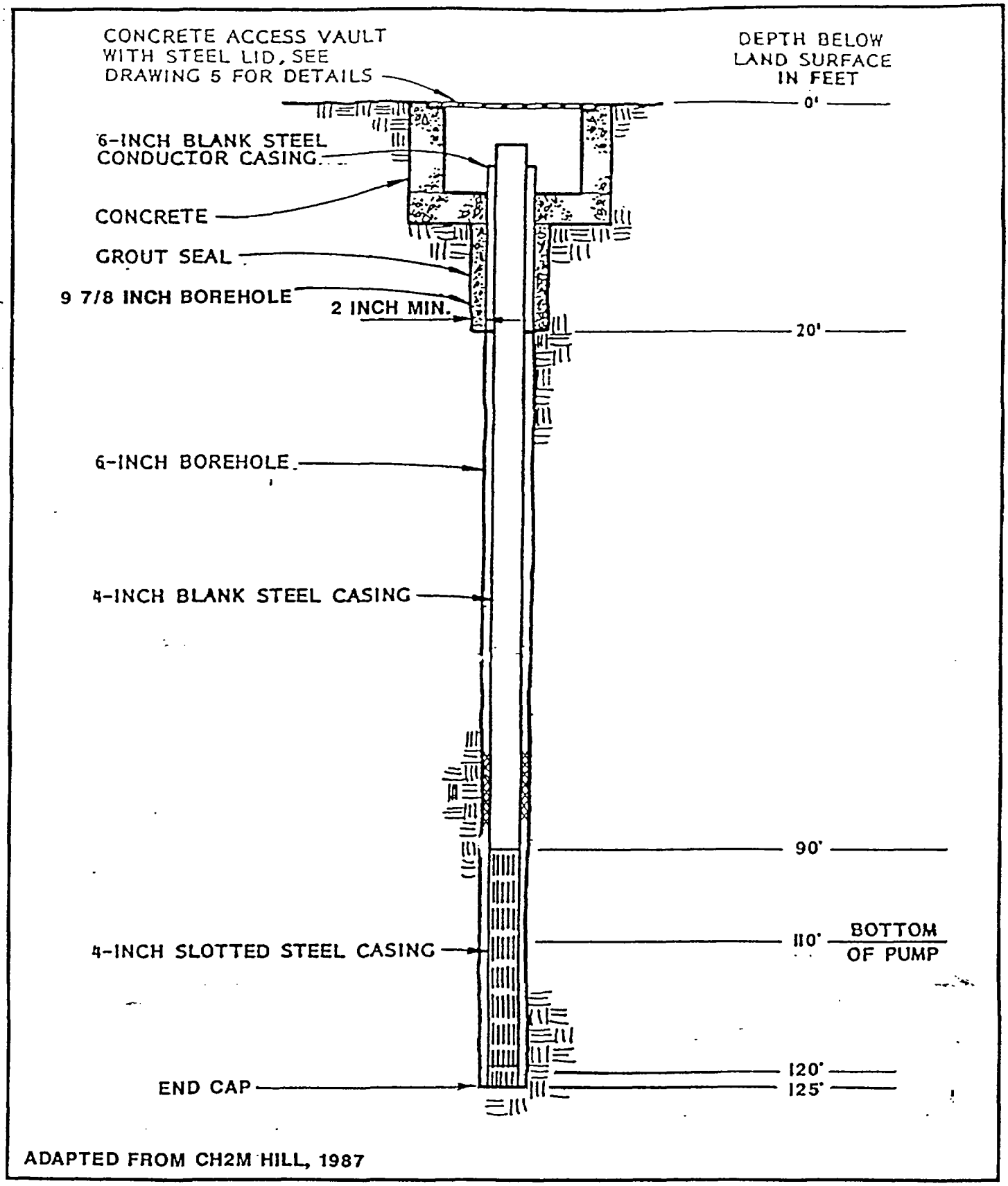
Upon completion of work at a site, all equipment shall be decontaminated before leaving the site as approved by the MARK Geologist or Engineer.

2.13.3 Disposal of Spoils and Other Materials

The Contractor shall make arrangements for the disposal of all waste material including drill cuttings, spent drilling fluids, water, and all other items. Materials shall be disposed of in accordance with all local, state, and federal requirements.

MARK shall sample and provide laboratory analysis of the contents of the spoils drums and shall classify each drum as hazardous or nonhazardous.

Upon notification by MARK, the Contractor shall dispose of contents of drums classified as hazardous at a RCRA-approved hazardous waste treatment, storage, or disposal facility in accordance with all federal, state, and local hazardous waste regulations. The Contractor shall obtain all permits and pay all fees to accomplish this work. Beckman Instruments will be the generator of such hazardous wastes and will sign manifests.



ADAPTED FROM CH2M HILL, 1987

Prepared By SJN Approved By RFK Date 8/12/88

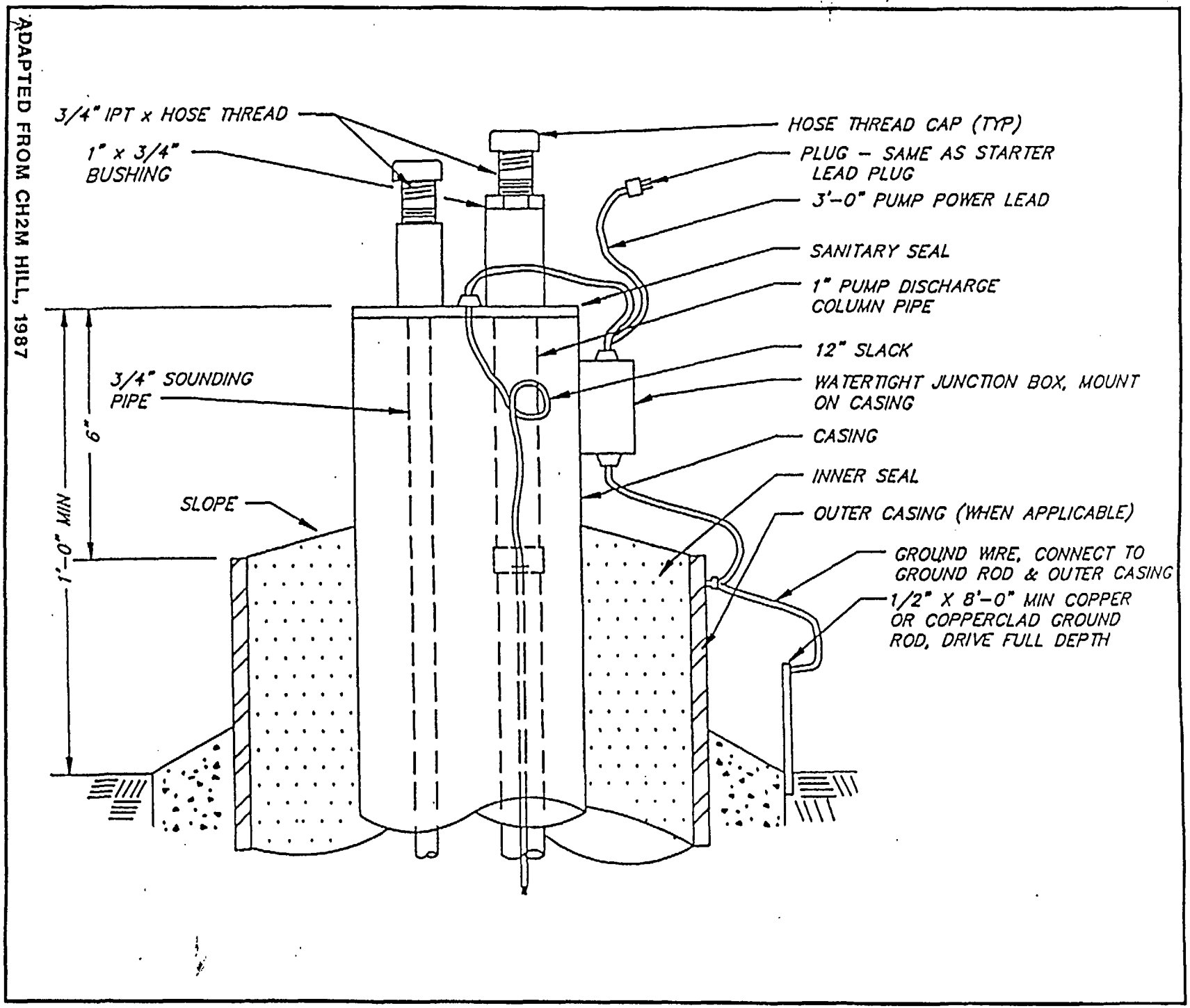
WELL CONSTRUCTION DIAGRAM, WELL '0'
UPPER ALLUVIUM UNIT
INDIAN BEND WASH
PHOENIX, ARIZONA

PROJECT NO. 84-2101.6

DRAWING NO. 2

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Prepared By SJN Approved By RFK Date 8/12/88



THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

WELL HEAD, WELL '0'
INDIAN BEND WASH
PHOENIX, ARIZONA

PROJECT NO. 84-2101.6

DRAWING NO. 3

Prepared By SJN Approved By RFK Date 8/12/88

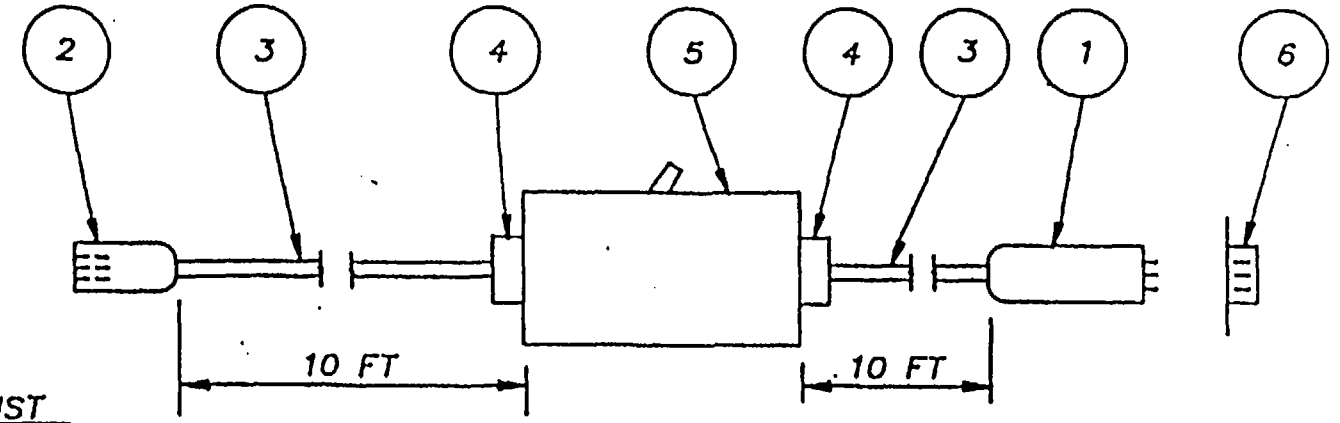
THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

STARTER LEADS, WELL '0'
INDIAN BEND WASH
PHOENIX, ARIZONA

PROJECT NO. 84-2101.6

DRAWING NO. 4

ADAPTED FROM CH2M HILL, 1987



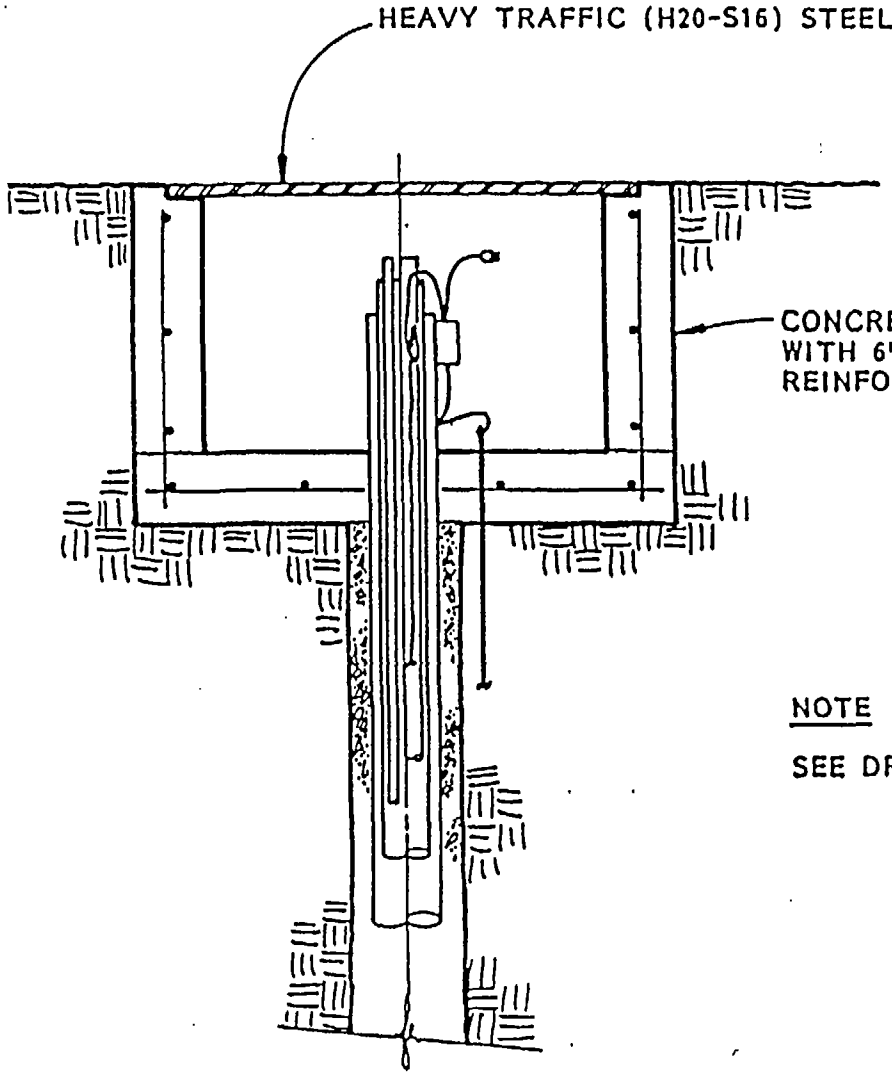
MATERIALS LIST

1. PLUG–20 AMPERE, 250 VOLT, CORROSION RESISTANT, TWISTLOCK
   NEMA L6–20P
   HUBBELL 2321 VY OR EQUAL
2. RECEPTACLE–20 AMPERE, 250 VOLT, CORROSION RESISTANT, TWISTLOCK
   NEMA L6–20R
   HUBBELL 2323 CY OR EQUAL
3. CORD–FLEXIBLE, 600V, TYPE SO, 12/2 WITH GROUND
4. CORD FITTING AND STRAIN RELIEF CONNECTOR
   CROUSE HINDS CGB SERIES; KILLARK Z SERIES; OR EQUAL
5. MOTOR START SWITCH–MANUAL MOTOR STARTER WITH OVERLOAD PROTECTION. TWO–POLE, 230 VOLT, SUITABLE FOR USE WITH AC SINGLE PHASE MOTORS UP TO 1 HORSEPOWER. NEMA 4 ENCLOSURE. SQUARE D CLASS 2510; WESTINGHOUSE TYPE MS OR EQUAL.
6. GENERATOR RECEPTACLE, ITEM 1 THIS LIST, HUBBELL NO. 2326 OR AS DETERMINED IN FIELD.

Prepared By SJN Approved By RFK Date 8/12/88

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

ADAPTED FROM CH2M HILL, 1987



NOTE

SEE DRAWING 3 FOR WELLHEAD DETAILS.

BELOWGRADE ACCESS BOX, WELL 'O'

INDIAN BEND WASH
PHOENIX, ARIZONA

PROJECT NO. 84-2101.6

DRAWING NO. 5

Section 3 - BOREHOLE LOGGING

In order to characterize sediments, a complete log of all conditions encountered during drilling will be maintained. This includes lithologic and hydrologic descriptions along with notations on drilling speed, drill-bit behavior, mud loss (if used), cuttings return rates, and bit weight pressures as it encounters different materials.

Major components of the log to be completed consist of the following:

- o At five-foot intervals, if possible, the field geologist or engineer will obtain a grab sample of the cuttings. Sample depth will always be noted.
- o The description of the drill cuttings using a sieve to catch and retain materials is to be used. The description shall include the following descriptions:
  - Color of cuttings;
  - Size of cuttings, e.g. cobbles, sand, silt, and clay according to the Wentworth size scale. (Unified Soils Classification System may be used for soil borings);
  - Percentage of cobbles, sand, silt, and/or clay;
  - Descriptive comments; e.g., degree of cementation, odor, HNu response;
- o If air rotary drilling methods are used, moisture of all the soil boring cuttings will be noted along with the depth of which ground water is first encountered.

- Drilling speed and rig behavior will be noted to help verify the nature of the material encountered by the drill bit.
- A portion of each cutting sample will be retained in a small sample bag for future reference. This sample will be tagged with the location and borehole number, the cuttings depth, and the date and time the cuttings were obtained.
- The on-site geologist will be responsible to write all the above information on appropriate field form(s) as indicated in Section 9.
- A sieve analysis sample will be collected from the section of the hole to be perforated.

Section 4 - GEOPHYSICAL LOGGING

Geophysical logging will be conducted by a qualified contractor who has operated in the Greater Phoenix area prior to undertaking this project.

Logs will be run after completion of the boring using air or mud rotary methods. The boring will be filled with a high quality bentonite mud circulated in the hole prior to tool entry to assure an even mud composition.

Geophysical logs will be run for:

- Caliper
- Spontaneous Potential
- Electrical Resistivity (short normal 16-inch and long normal 64-inch)
- Single Point Resistivity
- Natural Gamma Ray

The reference point will be on the surface casing as specified by the on-site geologist.

The drilling subcontractor will assist the borehole geophysical contractor as required with mud installation and circulation. The driller will also assist the geophysical subcontractor by supplying clean 55-gallon drums in good condition for the rinsate including absorbent for the solidification of the water if disposal is required through a hazardous waste landfill. A methanol rinse followed by a distilled water rinse will be used to clean the tool prior to tool entry and after completion of logging.

Section 5 - Ground Water Sampling Protocol

Sampling of the monitoring well may be divided into three parts: 1) measurement of well volume and water level, 2) evacuation of well water, and 3) obtaining the water sample. All information pertinent to sampling, such as the well designation, the time the pump is turned on and off, the time of sampling, and volume of water pumped will be recorded. Photograph each sampling location. Sample handling will follow the procedures in Section 7, Table 4.

A pre-sampling water level measurement will be taken, then the pump will be turned on and five borehole volumes will be evacuated. In addition, physical parameters (pH, specific conductance, temperature) will be monitored for each borehole volume removed until stable ($\pm$10 percent). If stabilization is not reached within 30 minutes after the five borehole volume evacuation, then the well will be sampled without stabilization.

- Take a water level measurement as specified in Section 9. See Table 1 for sampling equipment.
- Calculate the borehole water volume for well evacuation purposes using the following equation:

$$V = 7.48 \times 5 \ (\pi r^2 h + n(\pi R^2 h - \pi r^2 h))$$

$$V = 117.5 \ h \ (0.7r^2 + 0.3R^2)$$

Where:

V = volume to be pumped (in gallons)

h = Saturated thickness of ground water in the well, or the depth of well minus the depth to water (feet)

r = Radius of the well (feet)

Table 1

SAMPLING EQUIPMENT LIST

Sampling Equipment

Felt tip markers
Zip-lock bags
Electrical tape
Duct tape
Clear plastic tape, 3-inch wide
Packing material (bubble-pack and vermiculite)
Blue-Ice
Soil Boring Log Forms
Clipboards
Sample Data Forms
Stainless steel trowels
Eye-dropper bottle with 1 N HCl
Widemouthed glass jars, 8-ounce
Widemouthed glass jars, 16-ounce
VOAs, 40 ml vials
Polyethylene bottles, 1-liter
Amber glass bottles, 2.5-liter
Glass jars, 4-ounce
Headspace jars, 125 ml
Wash bottle
Plastic-coated cloth measuring tape, 12-foot
Teflon bailer
Rope
Temperature and EC meter
pH meter
Buffer solution, pH 4, 7, and 10
Teflon tape
Water level indicator

R = Radius of the borehole (feet)

n = Porosity

It is assumed that the porosity of the gravel pack is approximately 30 percent and five well volumes are to be pumped. If the aquifer being sampled has a low permeability and the well is readily pumped dry, the well will be pumped dry three times and the well sampled when it recovers a third time.

- o Turn on the pump, evacuate three to five borehole volumes, and monitor parameters for stabilization as described above.
- o Record all relevant data.
- o Collect the water sample in appropriate sample containers from the discharge valve at the wellhead after evacuation and stabilization.
- o Turn off the pump.
- o Measure recovery water levels at the first sampling event for that well, and only if pumping tests have not occurred previously at that particular well.

Ground water sampling will be conducted after completion of the well and on a quarterly basis. Initial analyses of ground water samples will include the following:

- o EPA Organic Priority Compounds (except pesticides)
- o Major Cations and Anions including pH, temperature, and specific conductance. These parameters are identified in Table 2.
- o Quarterly sampling will be for volatile organic compounds using EPA Method 624 (GC/MS). Sampling schedule will be

Table 2

Chemical Parameters for Analysis of Initial Sampling of Well O

Priority Compounds (organics)

All priority pollutants except pesticides

Priority Compounds (metals)

Antimony
Arsenic
Beryllium
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Selenium
Silver
Thallium
Zinc

Major Anions and Cations

Calcium
Magnesium
Sodium
Potassium
Carbonate
Bicarbonate
Chloride
Sulfate
Nitrate (as N)
Fluoride
Total Dissolved Solids (at 180 degrees Centigrade)
Boren
Silica

Miscellaneous

Langlier Index
Electrical Conductance at 25 degrees Centigrade
Color
Turbidity (NTU)
pH
Temperature

the same for other monitoring wells sampled in the project.

- o Annual sampling of major Cations and Anions including pH, temperature, and specific conductance.

Sampling for Organics

Volatile Organics (VOA):

- o Samples for VOA's are collected in 40-milliliter (ml) glass vials equipped with Teflon-backed silicon septum screw caps which have been decontaminated as specified in Table 3 (Section 7).
- o For sample vials not containing acid preservatives, the sample vial should be rinsed with sample water a minimum of three times to ensure that possible contaminants in the sample vial are removed. (When a preservative is used, do not rinse vial).
- o When sampling for volatiles, the 40 ml sample vials should have no headspace. To avoid aeration, the glass vial should be held at an angle so that the stream of water flows down the side. Fill the vial until it overflows to eliminate any air bubbles and replace the teflon-lined cap. A stainless steel cup may be used to fill the vial, if necessary. Two vials should be collected for each sample.
- o Turn the vial upside-down and tap it to check for air bubbles. If there are any bubbles, refill the vial and check for air bubbles again. Repeat this procedure until an acceptable sample is obtained.

- For each shipping container of samples, a VOA field blank (travel blank) sample should be prepared and included with the shipment.
- Duplicate samples will be collected as specified in Section 12.
- The samples will be cooled to 4 degrees Centigrade in the insulated transport container for shipment to the analytical laboratory following the Chain of Custody procedures shown in Section 6.

Acid Base/Neutral Organics:

- Samples for Acid Base/Neutral Organics are collected in two 1/2 gallon glass jugs with teflon lined caps which have been decontaminated as specified in Table 3 (Section 7).
- The sample jugs should be rinsed with sample water a minimum of three times and filled.
- For each shipping container of samples, one field blank (travel blank) will be prepared in the field using organic-free water or locally purchased distilled water.
- For each shipping container an Acid Base/Neutral blank sample should be prepared and included with the shipment.
- Duplicate samples will be collected as specified in Section 12.
- The samples will be cooled to 4 degrees Centigrade in the insulated transport container for shipment to the analytical laboratory following the Chain of Custody procedures shown in Section 6.

Sampling for Metals

- Water samples for metals analysis are collected in one liter high-density polyethylene bottles with solid polyethylene caps which have been decontaminated in the laboratory as specified in Table 3 (Section 7).
- Because the sample containers contain acid preservatives, they should not be rinsed in the field.
- Fill container with sample water without rinsing or overfilling.
- The samples are preserved with nitric acid to below pH 2.
- For each shipping container of samples a metals blank sample will be prepared and included with the shipment.
- Duplicate samples will be collected as specified in Section 12.
- The samples will be shipped to the analytical laboratory following the Chain of Custody procedures shown in Section 6.

Sampling for Other Inorganic and Priority Pollutants

- Water samples for analysis of other organics and priority pollutants are collected and preserved using containers and procedures specified in Tables 3 and 4 (Section 7).
- For each shipping container of samples, a field blank (travel blank) will be prepared and included with the shipment.
- Duplicate samples will be collected as specified in Section 12.

Section 6 - SAMPLE CONTROL/CHAIN-OF-CUSTODY

This section establishes procedures for sample identification and chain-of-custody. Beginning with collection and identification, the samples are maintained under Chain-of-Custody procedures. Field personnel involved with the sampling know Chain-of-Custody procedures. The procedures as included in this section are available to all field personnel.

Chain-of-Custody

Sample identification documents must be carefully prepared so that identification and chain-of-custody can be maintained, and sample disposition can be controlled. The sample identification documents are:

- Chain-of-Custody records
- Custody seals
- Field notebooks

The sampler must fill out adhesive sample labels and secure to the sample containers. Forms are filled out with waterproof ink. Where necessary, the label is protected from water and solvents with clear label protection tape.

To document sample possession, chain-of-custody procedures are followed. The procedures are outlined in the sections below.

Field Custody Procedures

- Collect only enough samples to provide a good representation of the medium being sampled. To the extent possible, the quantity and types of samples and sample locations are determined before the actual field work. As few people as possible should handle samples.

- The field sampler is personally responsible for the care and custody of the samples collected until they are properly transferred.
- All samples will have individual labels as shown in Figure 6. These labels will correspond to the Chain-of-Custody Record which shows the identification of individual samples and the contents of the shipping container. The original Record will accompany the shipment, and a copy will be retained by MARK.
- The project manager determines whether proper custody procedures were followed during the field work and resolves conflicts, if any.

Transfer of Custody and Shipment

- Samples are accompanied by a Chain-of-Custody Record (Figure 7). When transferring samples, the individuals relinquishing and receiving the samples will sign, date and note the time on the record. This record documents sample custody transfer.
- Samples are packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate Chain-of-Custody Record accompanying each shipment. Shipping containers are padlocked or sealed with Custody Seals for shipment to the laboratory (Figure 8).
- All shipments are accompanied by the Chain-of-Custody Record identifying its contents. The original record accompanies the shipment.

FIGURE 8. SHIPPING CONTAINER CUSTODY SEAL (ILLUSTRATIVE EXAMPLE)

ENGINEERS & GEOLOGISTS, INC.

Custody Seal

2300 Paseo Del Prado
Suite D-108
Las Vegas, Nevada 89102
(702) 364-1066

By:	Sample Type:
Date:	No. of Samples:
Shipment Via:	

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Figure 7.

Chain Of Custody Record

Project No.	Sample Point:
Date	

TIME	SAMPLE NUMBER	CONTAINER SIZE	ANALYZE FOR	PRESERVATIVE	HOLDING TIME	REMARKS

Relinquished by: (signature)	Date/Time	Received by: (signature)	Receiver represents:
Relinquished by: (signature)	Date/Time	Received by: (signature)	Receiver represents:

Expected analytical turn around time	24-hr RUSH	48-hr RUSH	7-day RUSH	14-day GUARANTEE	NORMAL (21 days)

2300 Paseo Del Prado, Suite D-108 Las Vegas, NV 89102 (702) 364-1066

Shipping Copy (White) File Copy (Yellow) Field Copy (Pink)

- Samples are routinely sent via Federal Express. Other equivalent means of shipment are acceptable.

Laboratory Custody Procedures

- A designated sample custodian accepts custody of the shipped samples and verifies that the information on the Sample Identification number matches that on the Chain-of-Custody Records. Pertinent information as to shipment, pickup, and courier is entered in the "Remarks" section.
- The laboratory custodian uses the Sample Identification number and assigns a unique laboratory number to each sample and ensures that all samples are transferred to the proper analyst or stored in the appropriate secure area.
- The custodian distributes samples to the appropriate analysts. Laboratory personnel are responsible for the care and custody of samples from the time they are received until the sample is exhausted, no longer suitable for analysis, or as otherwise directed by the MARK Project Manager.
- When sample analyses have been completed, the unused portion of the sample must be disposed of properly. All identifying tags, data sheets, and laboratory records are retained by the laboratory as part of the permanent documentation. Sample containers and remaining sample material are disposed of appropriately by the laboratory.

Custody Seals

When samples are shipped to the laboratory, they must be placed in padlocked containers or containers sealed with custody seals to ensure samples are not tampered with. An example of a custody seal is shown in Figure 8.

Two seals must be placed on each shipping container (cooler), one at the front and one at the back so as to allow the recipient of the container to make a determination as to whether or not the container has been opened. Clear tape should be placed over the seals to ensure that seals are not accidentally broken during shipment.

Field Records

In addition to sample identification numbers and Chain-of-Custody Records, field notebooks or daily activity records should be maintained by the field team leader to provide a daily record of significant events, observations, and measurements during field investigations. This information can be dictated and converted to written records as soon as possible during or immediately after cessation of that phase of field work. These documents will contain information such as: personnel present, site conditions, drilling procedures, sampling procedures, measurement procedures, calibration records, etc. Field measurements will be recorded on the appropriate forms.

All entries in the field notebooks and on data forms should be signed and dated. The field notebooks and data forms should be kept as permanent records.

Section 7. Sample Handling, Packaging, and Shipping

Substantial background data collection involving ground water and soil sampling has already been performed in the Indian Bend Wash study area. In all cases, the samples have been found to contain low concentrations of TCE, PCE, and other volatile organic compounds. This has included soil sampling in known historic waste evaporation ponds. Based on these findings and the type of samples to be collected, it is assumed that all samples collected will be low concentration samples. The procedures for handling, packaging, and shipping low concentration samples are outlined below.

Sample Handling

a. Organic Water Analyses

Two vials per sample will be collected for volatile organics analysis (VOA's). Samples for VOA's are collected in two 40-milliliter (ml) glass vials equipped with Teflon-backed silicon septum screw caps. Bottles and septa are washed with detergent, rinsed with organics-free water, and dried one hour at 105 degrees Centigrade as specified in Table 3. The number of containers required, preservative technique, and maximum holding time for parameters is found in Table 4.

Samples for Acid Base/Neutral Organics are collected in two 1/2-gallon glass jugs with Teflon-lined caps. This reduces the chances of losing an entire sample due to container breakage. New bottles and

TABLE 3.

WATER SAMPLE CONTAINER PREPARATION

Type of Analyses	Type and Size of Container	Container Cleaning
WATER		
Purgeable (Volatile) Organics	40 ml glass vial, Teflon-backed septum	Bottles and septa washed with detergent, rinsed with organic-free water and dried an hour at 105°C
Extractable Organics	One-half gallon bottle with Teflon-lined cap	Bottles and cap liners rinsed with methylene chloride and dried by vacuum or other safe means until no solvent remains
Metals	1 liter polyethylene bottle with Teflon-lined cap	Bottles are rinsed with dilute nitric acid and washed well with distilled or deionized water
Cyanides	1 liter polyethylene bottle with Teflon-lined cap	*
Routine Constituents	1 liter polyethylene bottle with Teflon-lined cap	*

* At a minimum, containers are washed with detergent and rinsed with distilled water.

TABLE 4.

WATER SAMPLE HANDLING PROTOCOL

Type of Analysis	Number of Containers and Sample Volume (per sample)	Preservation	Maximum Holding Time
WATER			
Purgeable (Volatile) Organics	Two (2); vials filled completely, no air space	Cool to 4°C (ice in cooler)	14 days
Extractable Organics	Two (2); total volume approx. 1 gallon	Cool to 4°C (ice in cooler)	Must be extracted within 7 days
Metals	One (1)	Nitric acid is below pH of 2 (approx. 1.5 ml Con HNO3 per liter)	6 months
Cyanides	One (1)	Sodium hydroxide to pH 12 and cool to 4°C (ice in cooler)	24 hours
Routine Constituents	One (1)	Cool to 4°C (ice in cooler)	

liners are rinsed with methylene chloride and dried by vacuum or other safety means until no solvent remains.

For each shipping container of samples, a VOA blank sample and an Acid Base/Neutral blank sample should be prepared, identified as separate samples, and included with field samples shipped to the analytical laboratory. Samples will be paced to avoid breakage or contamination during shipment and preserved as specified in Table 4.

Complete chain-of-custody records and other required documentation should be packed in a waterproof bag and included with the shipment. All samples should be labeled with sample tags which agree with chain-of-custody records. Pack samples to avoid breakage or contamination. Samplers should be thoroughly acquainted with all general and specific procedures for collecting and packaging samples (i.e. never use ice as a filler or packing material, never pack glass-to-glass, etc.)

b. Inorganic Water Analysis

Water samples for metals analysis are collected in one-liter high-density polyethylene bottles with solid polyethylene caps. The bottles are cleaned in the laboratory with dilute nitric acid and thoroughly washed with distilled or deionized water. Concentrated nitric acid is added to the bottles at the laboratory. Bottles should not be rinsed or overfilled in the field. The samples are preserved with nitric acid to below pH 2. Nitric acid concentration must not exceed 0.15 percent if the sample is to be shipped via air cargo.

Water samples for ammonia analyses are collected in 500 ml polyethylene bottles. The samples are preserved with sulfuric acid to below pH 2. The samples are then stored at 4 degrees Centigrade.

Water samples for pH and fluoride analyses are collected in 500 ml polyethylene bottles and are stored at 4 degrees Centigrade.

Water samples for routine constitutents analyses are collected in 1-liter polyethylene bottles.

Water samples for cyanide analysis are collected in 1-liter polyethylene bottles and preserved with sodium hydroxide to a pH greater than 12. The samples are stored at 4 degrees Centigrade.

Water samples for sulfide analysis are collected in one-liter polyethylene bottles, and preserved with 0.04 percent zinc acetate.

For each shipping container of samples, a field (travel) blank should be prepared and included with the shipment of field samples.

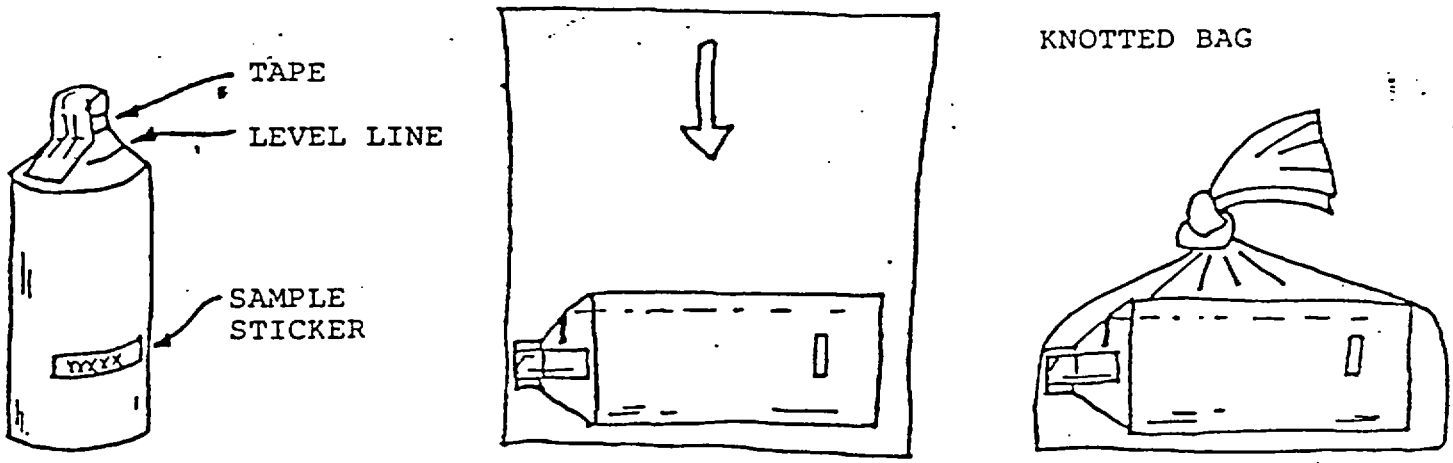
Complete chain-of-custody records and other required documentation should be packed in a waterproof bag and included with the shipment. All samples should be labeled with sample tags which agree with chain-of-custody records. Samples must be packed to avoid breakage or contamination.

Sample Packaging and Shipping

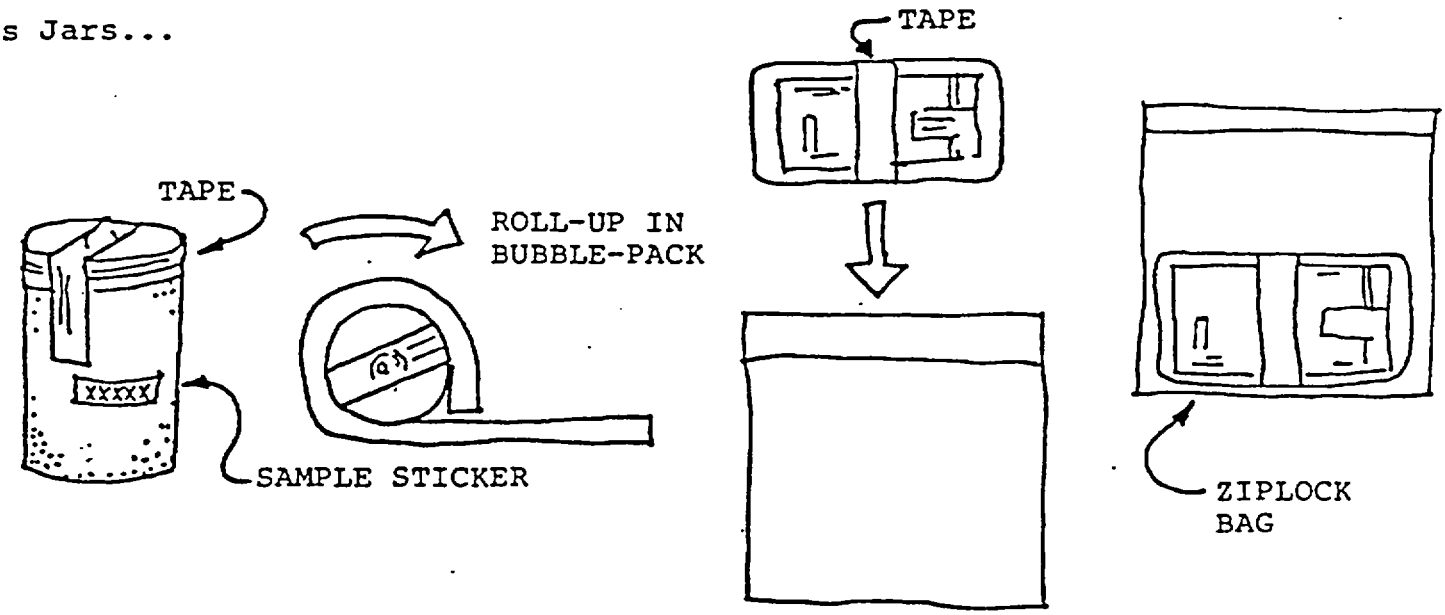
1. Read and fully understand the Sampling and Analysis Plan.
2. Collect samples in appropriate containers (see Table 3).
3. Add correct preservatives as necessary.
4. Print clearly in waterproof ink on the proper sample stickers sample identification data and the preservative, if any, that has been added to each aliquot. Figure 6 is an illustrative example.
5. Cover the sample stickers with one layer to strapping tape if it appears that adhesion to the sample container may be a problem.
6. Package sample containers as shown in Figures 9 and 10.
7. Assign airbills to coolers (Figure 11) and complete Chainof Custody forms using the correct airbill numbers. Use one Chain of Custody form per cooler.
8. Place samples into coolers according to lab destination. Remember each cooler must weigh less than 150 lbs. including ice. Keep samples upright and well protected from shipping damage.
9. Ice samples if necessary. Be sure to seal ice in a plastic bag other than the one it was purchased in.
10. Seal a copy of each Chain of Custody form inside of a ziplock bag. Use strapping tape to hold the package on the inside lid of the cooler.
11. Seal cooler with strapping tape. Several twelve inch strips are enough to do the job. Place two custody seals on each cooler and cover them with strapping tape to protect them.

FIGURE 9.

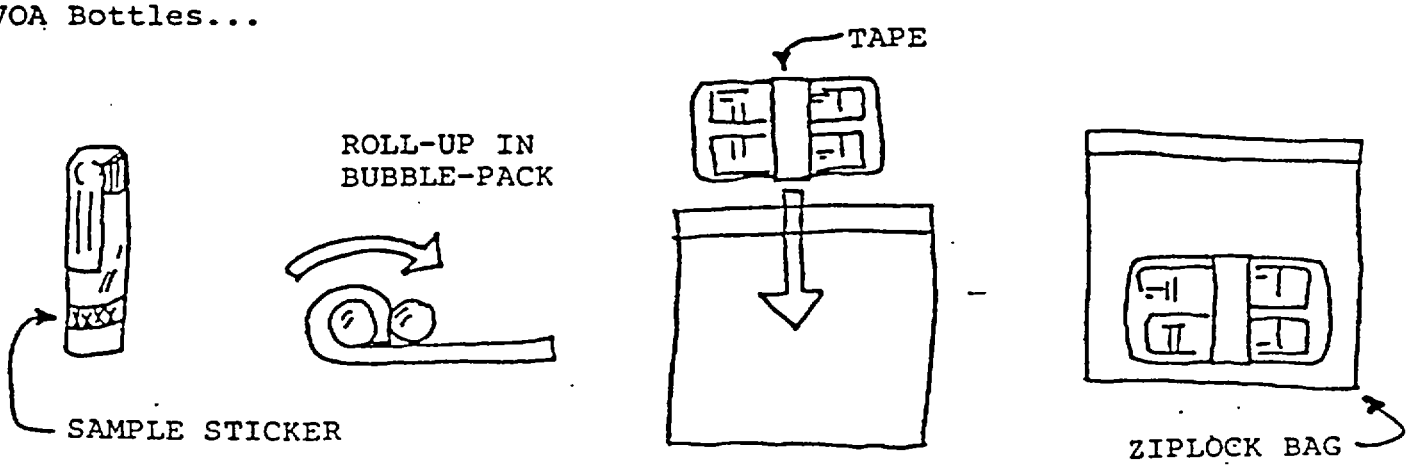
Plastic Bottles...



Glass Jars...

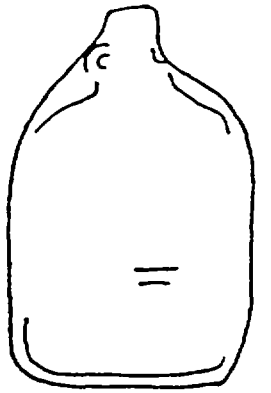


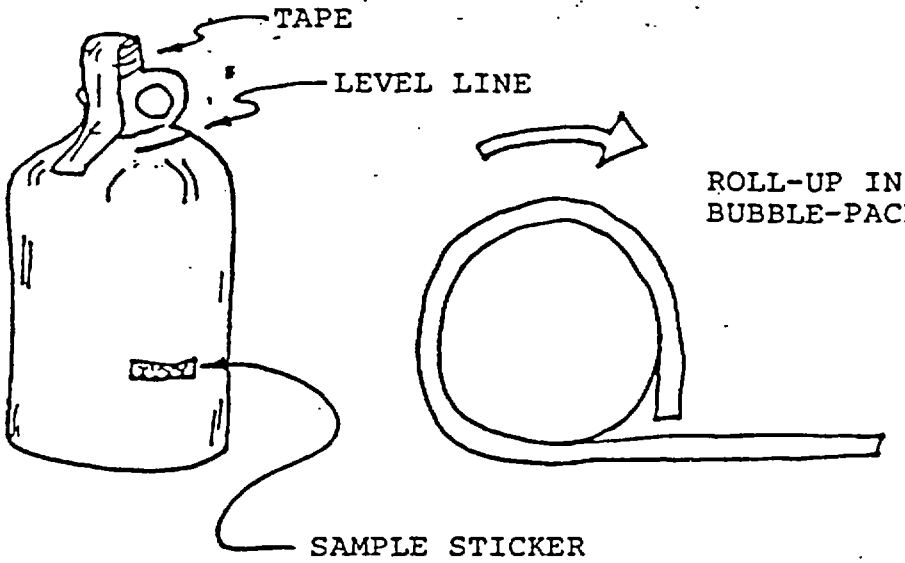
VOA Bottles...

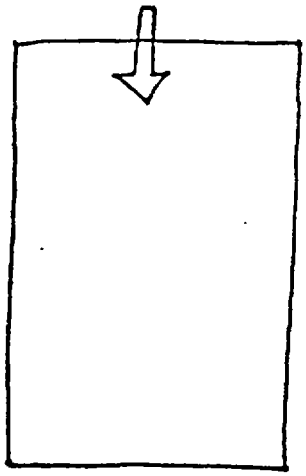


½ Gallon Bottles...

TAPE BUBBLE-PACK
ON BOTTLE

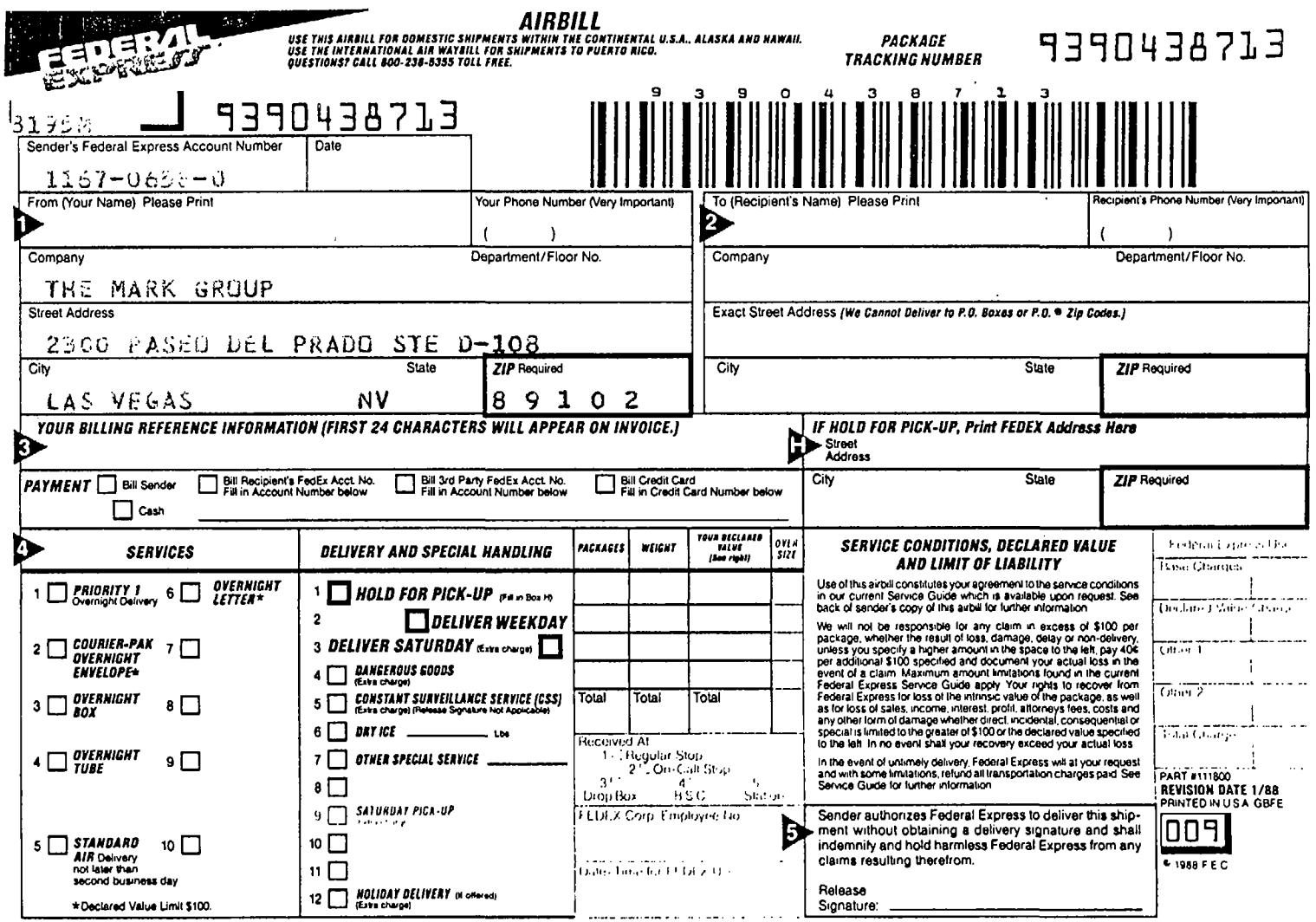






MEDIUM PLASTIC BAG

NOTE: THESE BOTTLES ARE VERY FRAGILE AND BREAK IF THEY ARE NOT PROTECTED WELL ENOUGH.



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City: LAS VEGAS State: NV ZIP Required: 8 9 1 0 2

2 To (Recipient's Name) Please Print:

Recipient's Phone Number (Very Important): ( )

Company:

Department/Floor No.:

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City: State: ZIP Required:

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.)

H IF HOLD FOR PICK-UP, Print FEDEX Address Here

Street Address:

City: State: ZIP Required:

PAYMENT ☐ Bill Sender ☐ Bill Recipient's FedEx Acct. No. Fill in Account Number below ☐ Bill 3rd Party FedEx Acct. No. Fill in Account Number below ☐ Bill Credit Card Fill in Credit Card Number below ☐ Cash

4 SERVICES

1 ☐ PRIORITY 1 Overnight Delivery
2 ☐ COURIER-PAK OVERNIGHT ENVELOPE*
3 ☐ OVERNIGHT BOX
4 ☐ OVERNIGHT TUBE
5 ☐ STANDARD AIR Delivery not later than second business day
6 ☐ OVERNIGHT LETTER*
7 ☐
8 ☐
9 ☐
10 ☐
*Declared Value Limit $100.

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1 ☐ HOLD FOR PICK-UP (Fill in Box H)
2 ☐ DELIVER WEEKDAY
3 DELIVER SATURDAY (Extra charge) ☐
4 ☐ DANGEROUS GOODS (Extra charge)
5 ☐ CONSTANT SURVEILLANCE SERVICE (CSS) (Extra charge) (Release Signature Not Applicable)
6 ☐ DRY ICE ____ Lbs
7 ☐ OTHER SPECIAL SERVICE
8 ☐
9 ☐ SATURDAY PICK-UP
10 ☐
11 ☐
12 ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT	YOUR DECLARED VALUE (See right)	OVER SIZE
Total	Total	Total	

Received At
1 ☐ Regular Stop
2 ☐ On-Call Stop
3 ☐ Drop Box 4 ☐ BSC 5 ☐ Station

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Date/Time Received

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Figure 11

TABLE 5. CONTROL LIMITS FOR INORGANIC ANALYSES

Analysis Method	Inorganic Species	% of True Value (EPA Set) Low Limit	High Limit
ICP Spectroscopy	Aluminum	85	115
	Barium	84	116
	Beryllium	87	113
	Boron	84	116
	Chromium	88	112
	Cobalt	78	122
	Copper	83	117
	Iron	88	112
	Manganese	90	110
	Nickel	89	111
	Silver	80	120
	Vanadium	90	110
	Zinc	75	125
Atomic Absorption Spectrometry	Arsenic	86	114
	Antimony	85	115
	Cadmium	80	120
	Lead	78	122
	Mercury	80	115
	Selenium	85	115
	Thallium	88	112
	Tin	75	125
Other Inorganic Analyses	Ammonia	80	120
	Cyanide	80	120
	Sulfide	85	115

TABLE 6. EXAMPLE INTERFERENT AND ANALYTE ELEMENTAL CONCENTRATIONS USED FOR INTERFERENCE MEASUREMENTS

Analytes	(mg/L)	Interferents	(mg/L)
Al	10	Al	1000
As	10	Ca	1000
B	10	Cr	200
Ba	1	Cu	200
Be	1	Fe	1000
Ca	1	Mg	1000
Cd	10	Mn	200
Co	1	Ni	200
Cr	1	Ti	200
Cu	1	V	200
Fe	1		
Mg	1		
Mn	1		
Mo	10		
Na	10		
Ni	10		
Pb	10		
Sb	10		
Se	10		
Si	1		
Ti	10		
V	1		
Zn	10		

100 ± 20% recovery required for ICP interference check.

TABLE 7
MATRIX SPIKE DUPLICATE/RECOVERY

CASE NO. _____ CONTRACTOR _____ CONTRACT NO. _____
LOW LEVEL _____ MED. LEVEL _____ HIGH LEVEL _____
WATER _____ SOIL/SED. _____ OTHER (Specify) _____
QC REPORT NO. _____ UNITS (Circle) ug/kg ug/L

FRACTION	COMPOUND	CONC. SPIKE ADDED	CONC. MS	% REC.	CONC. MSD	% REC	RPD	QC %RECOVERY LIMITS* RPD	WATER	SOIL	COMMENTS
VOA SMO # _____	1,1-Dichloroethylene							<15%	61-145	59-177	
	Trichloroethylene							<15%	71-120	62-137	
	Chlorobenzene							<15%	75-130	60-133	
	Toluene							<15%	76-125	59-139	
	Benzene							<15%	76-127	66-142	
B/N SMO # _____	1,2,4-Trichlorobenzene							<50%	39- 98	38-107	
	Acenaphthene							<50%	46-118	31-137	
	2,4-Dinitrotoluene							<50%	24- 96	28- 89	
	Di-N-Butylphthalate							<50%	11-117	29-135	
	Pyrene							<50%	26-127	35-142	
	N-Nitrosodi-N-Propylamine							<50%	41-116	41-126	
	1,4-Dichlorobenzene							<50%	36- 97	28-104	
ACID SMO # _____	Pentachlorophenol							<40%	9-103	17-109	
	Phenol							<40%	12- 89	26- 90	
	2-Chlorophenol							<40%	27-123	25-102	
	P-Chlor-M-Cresol							<40%	23- 97	26-103	
	4-Nitrophenol							<40%	10- 80	11-114	
PEST SMO # _____	Lindane							<40%	56-123	46-127	
	Heptachlor							<40%	40-131	35-130	
	Aldrin							<40%	40-120	34-132	
	Dieldrin							<40%	52-126	31-134	
	Endrin							<40%	56-121	42-139	
	P,p-DDT							<40%	38-127	23-134	

*Asterisked values are outside QC limits.

RPD: VOAs ____ out of ____; outside QC limits
B/N ____ out of ____; outside QC limits
ACID ____ out of ____; outside QC limits
PEST ____ out of ____; outside QC limits

RECOVERY: VOAs ____ out of ____; outside of QC limits
B/N ____ out of ____; outside of QC limits
ACID ____ out of ____; outside of QC limits
PEST ____ out of ____; outside of QC limits

*Advisory Limits
Revised 12/83

12. Coolers must be labeled correctly. "Fragile" and "This-end-up" labels go on all four sides of each cooler. These labels must be completely uncovered and clearly 100% visible.
13. Ship samples. Be sure to keep coolers and airbills organized so that shipping destinations are correct.
14. Telephone analytical laboratory with airbill numbers and sample data ASAP.

Section 8. GENERAL ANALYTICAL LABORATORY REQUIREMENTS

In general, the laboratory should adhere to those recommendations as promulgated in 21 CFR Part 58, "Good Laboratory Practices", criteria described in "Methods for Chemical Analysis of Water and Wastes," 1979 (EPA-600/4-79-020), and 40 CFR Part 136 (Code of Federal Register, October 26, 1984).

1. Purity of Standards, Solvents, and Reagents

   All reagents will be of the standard laboratory quality obtainable. Where applicable, reference standards solutions will be traceable to National Bureau of Standards (NBS). Each new lot of reagent grade chemicals shall be tested for quality of performance. These shall be tested by injection into gas chromatograph (GC) to determine the extent of interferences in the GC profile.

2. Glassware

   All glassware used in organic analyses requires special cleaning. Plasticware will not be used because other organic compounds may be extracted by solvents and produce interferring peaks on the gas chromatogram. Preparation of glassware and other sample containers is outlined in Section 7.

3. Analytical Analyses

   a. Laboratory pure water is prepared by a special deionized water system augmented by individual filter cartridges and polishers located at each outlet point. The polishers include special particulate filters, organics resins, and inorganic resins.

b. Special deionized water which has been boiled and purged with nitrogen gas will be used for volatile/priority pollutant analyses. Water prepared in this manner should be free of contamination and be free of interference peaks when injected into the gas chromatograph.

c. Field Blank

All water samples submitted for volatile organic compounds or priority pollutant analysis must be accompanied by a field blank. Field blanks are prepared prior to shipment to the laboratory, using organic-free water or locally purchased distilled water. They are stored alongside the collected samples and shipped back to the laboratory for analysis. Field blanks are analyzed with the field samples and they indicate whether the sample bottles were exposed to contaminants during handling and transit or if samples were cross-contaminated. Where possible, the laboratory should not be told which sample is the field blank.

d. Other QA/QC Samples-Inorganics

1. Method Blanks: Method blanks will be analyzed every 20 samples.
2. Spikes: Both digest and sample (matrix) will be analyzed every 20 samples. All metals will be added at 10 times the detection limit.
3. Duplicates: Duplicate samples will be analyzed every 20 samples.

4. Instrument Calibration: Both AA & ICP instruments are calibrated (3 point standard curve) prior to sample analysis. Continuing calibration checks are performed after every 10 sample analysis.

5. Interference Standard Check (ICP): An interference check is run prior to and after completion of each analysis set.

e. Other QA/QC Samples-Organic

1. Method Blanks: Method blanks will be analyzed every 10 samples.

2. Matrix Spikes: A matrix spike will be analyzed every 10 samples to monitor accuracy. The sample will be spiked prior to extraction, and results reported as a % recovery.

3. Duplicate Spikes: A duplicate spike will be analyzed every 10 samples to monitor precision. The same sample that was used as a matrix spike will be spiked prior to extraction a second time. The results will be recorded as a % discovery, and as an RPD (Relative Percent Different value to compare with the matrix spike).

4. Surrogate Recoveries: All samples will be spiked with 3 acid and 3 base/neutral surrogates to monitor recovery in every sample. These results will be reported with the QA/QC package.

5. In addition, all standards are checked every 8 hours, against a 3 point calibration curve using the most recent EPA criteria.

4. Quality Assessment

Accuracy is defined as a percent recovery for a spiked sample for organic analyses. Both matrix spikes and surrogate spikes are used to evaluate the data for accuracy. Every tenth sample is a matrix spike, which is an actual sample spiked with a representative group of priority pollutants such as those listed on Table 7. Three acid and three base/neutral surrogates will be spiked into every sample to monitor recovery. Inorganic analyses require a matrix spike recovery for all parameters analyzed and an ICP interference check for those metals analyzed by inductively coupled plasma (see Tables 5 and 6 for the inorganic percent recovery limits).

Precision is defined as the relative percent difference of matrix spike recoveries for two matrix spikes of the same sample (matrix spike [MS] and matrix spike duplicates [MSD] recoveries as shown on Table 6). The relative percent difference (RPD) should be less than the value shown on Table 7.

Section 9 - FIELD MEASUREMENTS

This section describes the routine procedures to be followed by all personnel performing field measurements. Field measurements will be collected during drilling activities, sampling of groundwater, water level measurement and short-term single-well aquifer testing. Forms to be used for field measurements will be similar to those shown at the end of this Section.

Water Level Measurements

The measuring devices to be used will be electric sounders and steel tape.

a. Electric Sounder

A battery-powered Olympic sounder (or equivalent) will be used for water level measurements. The sounder will have marks on the sounder line at regular intervals.

Each sounder will be accompanied by a calibration log book which will show: 1) time and date of last calibration, 2) the point of calibration (either the center of a mark on the sounding line or along the extreme of the first mark near the probe), 3) who did the calibration and 4) how it was accomplished.

A calibration check will be made in the field by taking a water level measurement with the sounder and checking the measurement with a steel tape. The difference between the two measurements should be less than 0.1 feet per 100 feet of depth to water. These calibration checks will be logged in the calibration log book. Each

well will be sounded twice for depth to water; the variation must be less than 0.1 foot between the two measurements.

b. Steel Tape Method

A graduated steel tape will be used for water level measurements as a quality control check for the electric well sounder. The steel tape will be graduated in permanent markings at regular intervals.

The steel tape will be periodically checked for kinks and will have the first 5 to 10 feet chalked before each measurement. The tape will be lowered down the well slowly as so to avoid contact with the casing. If an approximately depth to water is not already known, then no more than 50 feet of tape will be lowered at a time before it is removed and checked. Once the approximately water level is established, two separate water level measurements will be made or until the difference between any two is less than 0.05 feet.

The following procedures will be used for water level measurements:

- Record the measuring point (MP) at the well-head. (Refer to the accompanying illustrations of measuring points and the appropriate terminology for various points). The same measuring point must be used for subsequent measurements.
- Survey elevations of measuring point to the nearest 0.1 foot.

- Record the distance from the measuring point to the ground level and define 'ground level' at that well site, e.g., cement platform.
- Turn on the water level instrument for measuring wells. Check probe operation by inserting in container of distilled water and note needle deflection. Lower the probe slowly into the well, minimizing contact with the sounding pipe or well casing lip. When the probe contacts the water, the line is marked at the measuring point; the distance from the mark to the nearest "tape band" is measured and added to (or subtracted from) the band reading to obtain the depth to water (to within one hundredth of a foot). The measurement should be repeated twice. Record the depth to water. The water level instrument should have been calibrated within the last month. Use the most recent calibration table for data compilation.
- If an electrical sounder is not available or to check the accuracy of the electrical sounder, a steel tape can be used for water level measurement. Use a 300 or 500 ft. tape, calibrated to 0.01 of a foot. Repeat the measurement 3 times or until 2 readings within 0.02 feet of each other have been obtained.
- Record all information on appropriate form(s).
- Remove all equipment, decontaminate and proceed to next well.

Field Parameters

Conductivity, temperature, and pH measurements will be made when each water sample is collected. A Beckman pH meter will be used for field pH determinations. A combination conductivity-temperature meter will be used for the remaining field parameter measurements.

All instruments will be periodically calibrated to ensure accuracy. All probes will be thoroughly rinsed with distilled water prior to any measurements.

Regardless of the sample collection method (bailer or pump), a representative water sample will be placed in a nalgene or glass transfer bottle or beaker used solely for field parameter determinations. Measurements will be made as follows:

- The transfer containers will be rinsed with sample water prior to filling.
- Probes will be immersed in the transfer container and measurements will be taken accordingly.
- All field measurements will be recorded in a bound field log book along with the sample location, the time and date of measurement, and the time the sample was obtained.
- After parameters are obtained the transfer containers will be decontaminated by: 1) distilled water rinse, 2) methanol rinse, and 3) distilled water rinse. If the transfer container cannot be cleaned a new container will be used.
- Alternatively, disposable transfer containers, not requiring decontamination, may be used.

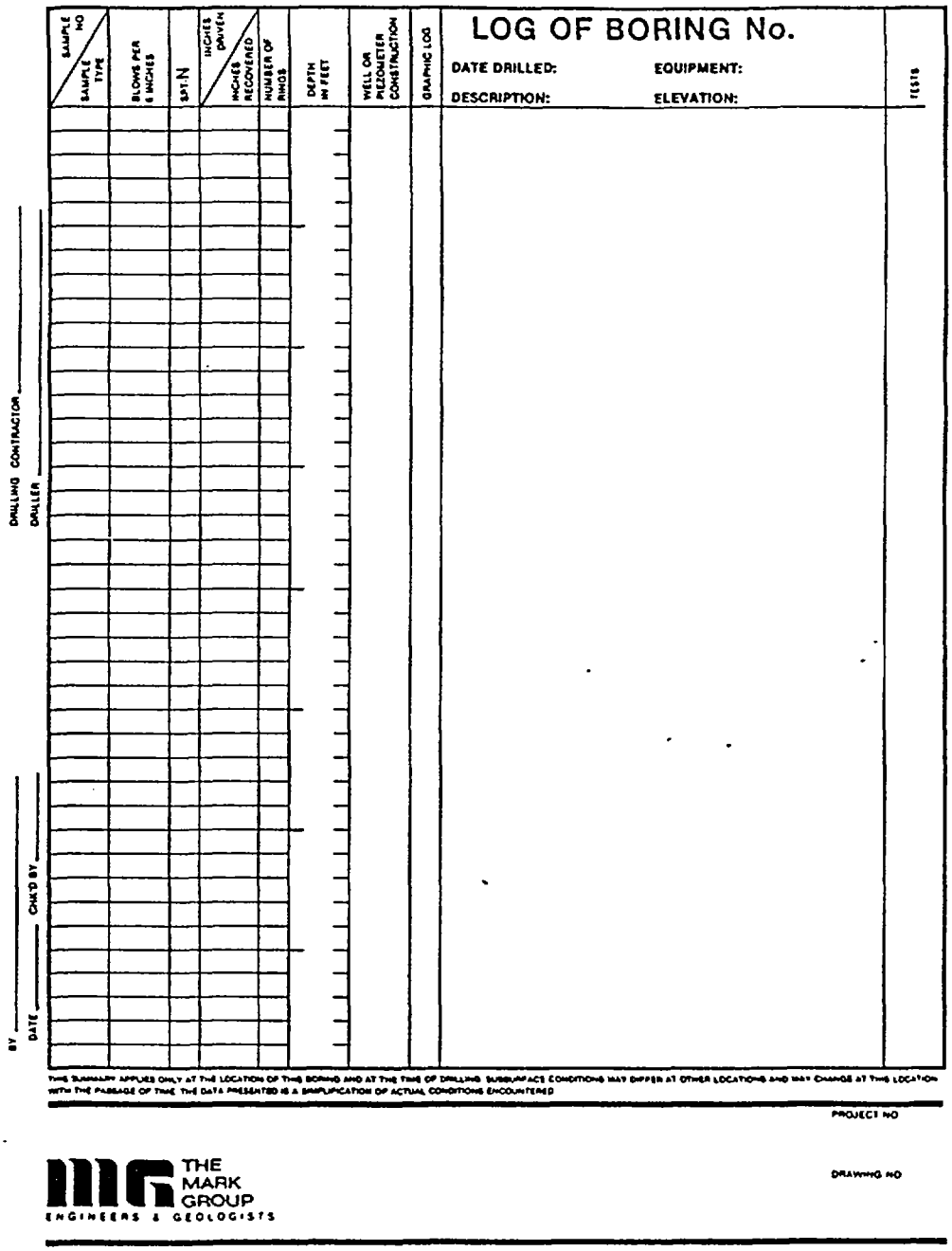
Borehole Logging

In order to characterize the encountered sediments a complete log of all conditions encountered during drilling will be maintained. This includes lithologic and hydrologic descriptions along with notations on drilling speed, drill-bit behavior, mud loss, cuttings return rates, and bit weight pressures as it encounters different materials. These observations are reported on Figure 12.

Major components of the log to be completed consist of the following:

- o At five-foot intervals, if possible, the field geologist or engineer will obtain a grab sample of the cuttings. Sample depth will always be noted.
- o The description of the drill cuttings shall include the following descriptions:
  - Color of cuttings
  - Size of cuttings, e.g. cobbles, sand, silt, and clay according to the Wentworth size scale. (Unified Soils Classification System may be used for soil borings)
  - Percentage of cobbles, sand, silt, and/or clay
  - Descriptive comments; e.g., degree of cementation, odor, HNu response
- o If air rotary drilling methods are used, moisture of all the soil boring cuttings will be visually noted along with the depth at which ground water is first encountered.

FIGURE 12.


LOG OF BORING No.
DATE DRILLED:
EQUIPMENT:
DESCRIPTION:
ELEVATION:
SAMPLE NO / SAMPLE TYPE
BLOWS PER 6 INCHES
SPT N
INCHES DRIVEN / INCHES RECOVERED
NUMBER OF RUNS
DEPTH IN FEET
WELL OR PIEZOMETER CONSTRUCTION
GRAPHIC LOG
TESTS
DRILLING CONTRACTOR
DRILLER
BY
DATE
CHK'D BY
THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.
PROJECT NO
THE MARK GROUP
ENGINEERS & GEOLOGISTS
DRAWING NO

- o Drilling speed and rig behavior will be noted to help verify the nature of the material encountered by the drill bit.
- o A portion of each cutting sample will be retained in a small sample bag for future reference. This sample will be tagged with the location and borehole number, the cuttings depth, and the date and time the cuttings were obtained.
- o The on-site geologist will be responsible to write all the above information on appropriate field form(s) (Figure 12).
- o A sieve analysis sample will be collected from the section of the hole to be perforated.

Different drilling methods may be employed during the drilling program, including air and mud rotary. Each drilling method yields different types of drill cuttings associated with the cutting action of the drill bit. Air and mud rotary drilling tends to pulverize the coarser fractions of the formation. These considerations will be taken into account when logging a borehole.

Well Drilling and Well Design

Wells will be constructed according to the well specifications (Section 2). Wells will be constructed with the following documentation undertaken:

- o The casing length measured to the nearest .1 foot or 1 inch, and type will be recorded for each piece of blank and slotted casing. Figure 13 is used for this purpose.

FIGURE 15.

CASING and SCREEN RECORD

WELL OR HOLE ______
PAGE ______ OF ______

PROJECT ______
REFERENCE POINT: GROUND LEVEL ______
LOCATION ______
ELEVATION ______
KELLY BUSHING ______
PERSONNEL ______

ITEM NUMBER	CASING LENGTH		SCREEN LENGTH		CUMULATIVE LENGTH		REMAINING LENGTH		DEPTH INTERVAL		DESCRIPTION-COMMENTS
	(FT.)	(METERS)	(FT.)	(METERS)	(FT.)	(METERS)	(FT.)	(METERS)	(FT.)	(METERS)	(SIZE, THICKNESS, WEIGHT, STRENGTH, WELD OR THREAD, MATERIAL, BRAND, ETC.)

- o The depth of the boring to the nearest .1 foot will be measured using a sounder.
- o All depths and other specifications will be recorded on the construction log (Figure 14).

Well Discharge Measurements

During short-term single-well aquifer tests and ground water quality sampling events, field measurements will be made to determine the flow rate of the water discharging from the well. Figures 15 through 21 are used for this purpose. This will be accomplished as described below:

(a) Equipment needs are a 5 to 15 gallon container and a stop watch.

(b) Discharge from the well is directed into the container, and the stopwatch is started. The stopwatch is turned off when the container is full. This will give the time in minutes and seconds that it took to discharge so many gallons of water from the well.

Convert the rate of discharge to gallons per minute and record the time this measurement was taken and the rate of flow in gallons per minute.

Short-Term Single-Well Aquifer Testing

The following protocols will be observed during short-term aquifer tests:

- o The discharge rates and time of pumping must be determined beforehand and the pump checked to ensure that it is capable of producing the required rates.

FIGURE 14.

CONSTRUCTION LOG OF WELL No.

Well Type: _____

Casing Type: _____

Casing Dia: _____

Casing Lengths: _____

_____

Screen Size: _____

Screen Length: _____

Tailpipe Length: _____

Locking Cover Type: _____

Locking Cover Stickup (+)/Depression (−): _____

Filter Material: _____

_____

Filter Volume: _____

Seal Material: _____

_____

Seal Volume: _____

Grout Material: _____

_____

Grout Volume: _____

Bore Dia: _____

Total Depth: _____

Comments: _____

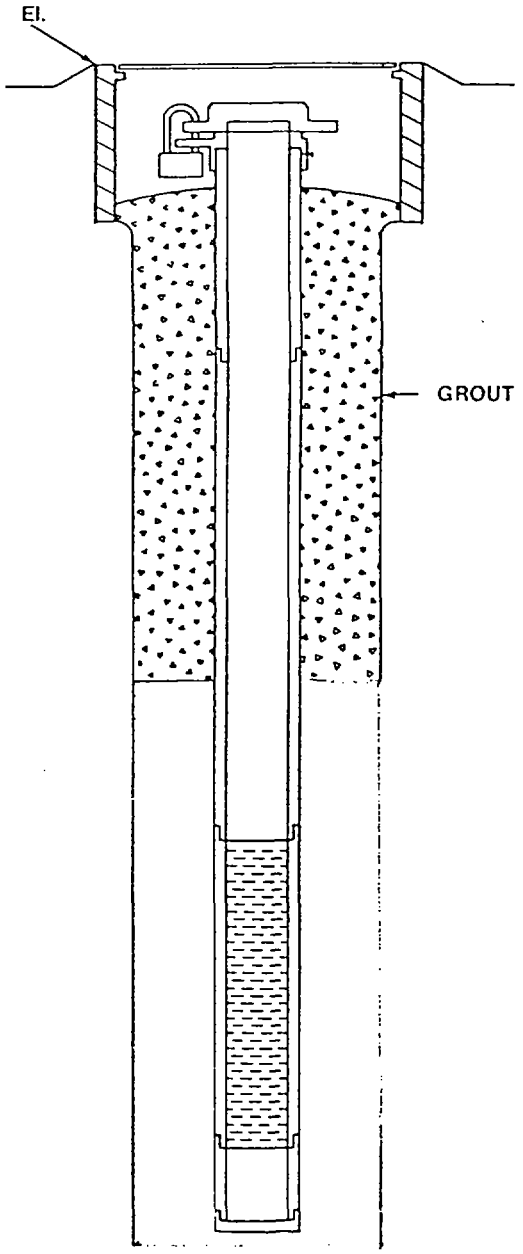
_____

_____

_____

DEPTH IN FEET

Date Completed:



Prepared By _____ Approved By _____ Date _____

THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS. THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS WELL AT THE TIME OF CONSTRUCTION. CONDITIONS SHOWN MAY CHANGE WITH THE PASSAGE OF TIME.

PROJECT NO.

DRAWING NO.

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

REPT—7 2/21/86

FIGURE 15.

THE MARK GROUP
ENGINEERS & GEOLOGISTS

WATER PURGING AND SAMPLING LOG

Project No.:_____ Date:_____

Project Name:_____

Sample Location:_____

Weather Conditions:_____

Observations/Comments:_____

QUALITY CONTROL

Sampling Method:_____

Method to measure water level:_____

Pump lines or bailer ropes new, cleaned or dedicated?_____

Method of cleaning Bailer/Pump:_____

pH Meter No.:_____ Calibrated:_____

Specific Conductance Meter No.:_____ Calibrated:_____

Comments:_____

PURGING MEASUREMENTS

Water level (below MP) start:_____ end:_____

Measuring Point (MP):_____

Time	Discharge (gallons)	pH	Temp (C)	Sp. Conductance umhos/cm field	Sp. Conductance umhos/cm @25 C	Color	Odor	Turbity

Total Discharge:_____ Casing volumes removed:_____

Method of disposal of discharge water:_____

Sheet ___ of ___

FIGURE 16.

WELL-HEAD AND DOWN-HOLE EQUIPMENT STATUS

Page ___ of ___

Arizona Well I.D.	Well Name or Number	Type of Pump (include manufacturer)	Depth to Pump or Depth to Bowls (feet below ground surface)	Length of Airline (feet below ground)	PUMP DISCHARGE MEASUREMENT:		
					In-Line Flow Meter (Type and I.D. No.)	Electric Power Meter (Type and I.D. Number)	Other Method(s) of Discharge Measurement which have been used.
		TO BE COMPLETED PRIOR TO THE START OF FIELD ACTIVITIES					

FIGURE 17.

THE MARK GROUP
ENGINEERS & GEOLOGISTS

Field Water Level Measurements

DATE: _____ PROJECT No.: _____

PERSONNEL: _____ HOW MEASURED/DEVICE: _____

_____ LAST CALIBRATION DATE: _____

WEATHER: _____ COMMENTS: _____

Time	Well No.	Predicted or Measured Tide Level*	Top of Casing Elevation (Measuring Point)	Depth Below Top of Casing (MP)	Water Level Elevation

* TIDE TABLE REFERENCE: _____

FIGURE 18.

Diagram of Measuring Points
(Az Dept. of Water Resource, 1983).

HTCA, W	Hole in top of casing, west side
HSCA, N	Hole in side of casing, north side
TCA, SE	Top of casing, southeast side
HBOP, S	Hole in pump base, south side
BOP, N	Access under base of pump, north side
ACTB, S	Measuring (access) tube, south side
AIRL, S	Airline, south side
HISP, NE	Hole in submersible cap plate, northeast side
SPHS, NE	Sounding Pipe with access in submersible cap plate, North east side

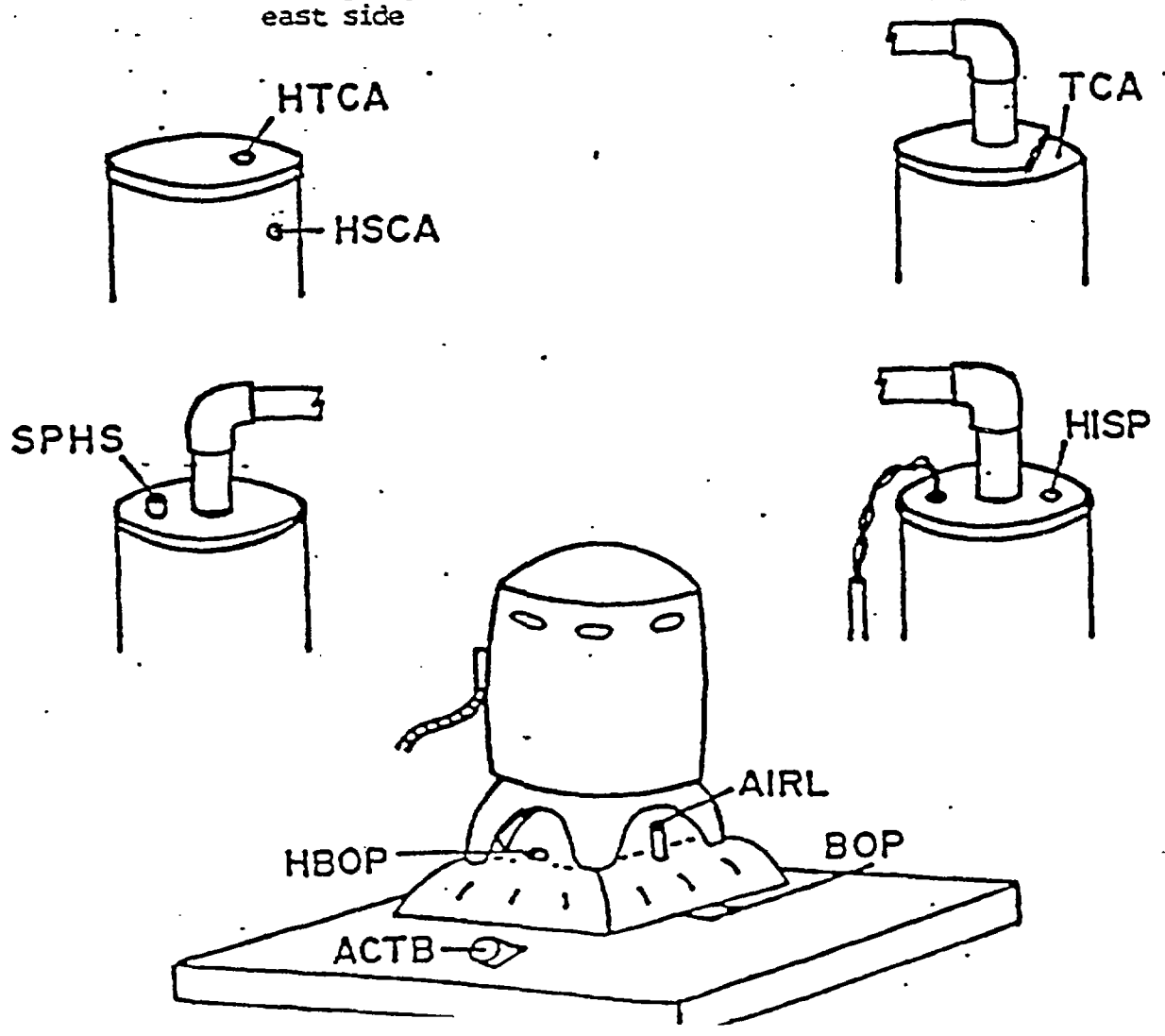


FIGURE 19.

WELL DISCHARGE SUMMARY SHEET

Date of Surveys _____ to _____ Data Collected by _____ Page ___ of ___

Survey Well I.D.	Owner	Date Measured	Elapsed Time Since Pumping Started (Days, Hours, Minutes)	Discharge at Survey Well (gpm)	Adjacent (Active) Well I.D.	Elapsed Time Since Pumping Started (Days, Hours, Minutes)	Discharge at Adjacent Well (gpm)

FIGURE 20.

FIELD PARAMETERS

Arizona Well I.D.	Well Name or Number	Date	Time	pH	Electrical Conductance	Temperature	Notes

FIGURE 21.

AQUIFER TEST DATA

WELL OR HOLE ____________
PAGE ________ OF ________

PUMP ON DATE ______ TIME ________
PUMP OFF DATE ______ TIME ________
DURATION OF AQUIFER TEST ____________

HOW W.L.'s MEASURED ____________
DISTANCE FROM PUMPING WELL ____________
MEASURING POINT ____________
ELEVATION MEASURING POINT ____________

HOW Q MEASURED ____________
DEPTH OF PUMP/AIRPIPE ____________
TYPE OF TEST ____________
PREVIOUS PUMPING ____________

PERSONNEL

LOCATION

PROJECT

RECORDED BY	TIME t= ______ AT t' = 0						WATER LEVEL DATA SWL ______					DISCHARGE DATA			COMMENTS
	DATE	CLOCK TIME	PUMPING ELAPSED TIME t	RECOVERY ELAPSED TIME t'			READING	CORRECTION OR CONVERSION	WATER LEVEL	W.L. CHANGE s or s'		READING	RATE (GPM)(LPS)		

- Methods of measuring pump discharge and water level changes must be field checked and calibrated prior to the start of the test.
- Proper data forms and data acquisition systems are to be set up prior to the start of the test.
- Barometric pressure will be monitored prior to the start of the test and during the test.
- At the initiation of the test the following intervals or equivalent gradual increase in intervals will be used in measuring water levels:

From	0 to	15 minutes	every minute
	15 to	90 minutes	every 5 minutes
	90 to	300 minutes	every 15 minutes
	300 to	900 minutes	every 30 minutes
	900 to	1440 minutes	every 60 minutes

- Similar time intervals as those used during pumping will be used when the pump is turned off and recovery is being monitored.
- Well discharge will be measured at the following time intervals (or equivalent gradual increase in intervals):

From	0 to	60 minutes	every 5 minutes
	60 to	300 minutes	every 15 minutes
	300 to	900 minutes	every 30 minutes
greater than		900 minutes	every 90 minutes

- An alternative plan of action will be formulated in case of premature pump stoppage or other problems.
- All times will be correlated with a master clock time denoting time zero as the time at which the pump is first turned on.
- All measurements of water levels and discharge will be made at the same measuring point each time.

The specific length of time to pump a well, the discharge rate, and the time to monitor recovery after pumping has stopped will be determined on a test-by-test basis and outlined in the Sampling Plan. Generally, the recovery will be measured for as long as the pumping lasted or until the water level reaches at least 90% of pretesting levels. Decisions will be made by the MARK field geologist or engineer when to stop. Alternative testing procedures, if needed, will be decided based on field conditions and discussions between the field geologist or engineer and The MARK Group project manager.

Section 10 - DECONTAMINATION PROCEDURES

Drilling

Prior to mobilization of the drill rig on site, the rig and all associated equipment will be thoroughly cleaned to remove all oil, grease, mud, etc. This cleaning process will consist of high pressure hot-water or steam cleaning. All casing, screen, and tubes should arrive on site clean.

Between holes all equipment used down hole should be cleaned in the following manner:

1. Hose down and brush equipment to physically remove dirt on equipment.
2. Wash off using high pressure water or steam with soap additives (TSP) or Liquinox, then straight water.
3. Rinse with distilled water.
4. Allow to air dry.

The monitoring well contractor will provide a means for collection and storage of contaminated solvents, washwater, and related materials.

Well Development and Aquifer Testing

All equipment used in well development and aquifer testing should be cleaned prior to and after use. Equipment should be cleaned using procedures similar to those followed for equipment decontamination during drilling.

Water Level and Geophysical Equipment

The steel tape or electrical sounder will be clean prior to entering the site and will be decontaminated after we use the following:

All tools, liners, split spoons, tools used to prepare samples were decontaminated in the following methods:

1. Wash off all the above equipment in a bucket of water mixed with TSP and water and brush to physically remove all dirt.
2. Rinse in a bucket of clean water.
3. Rinse with methanol using a garden sprayer.
4. Rinse with distilled water.
5. Air dry.

Geophysical logging tools will be cleaned prior to use using methanol rinse followed by a distilled water rinse.

DISPOSAL OF DRILL CUTTINGS, DEVELOPMENT WATER, DISCHARGE WATER AND RINSATE AND WASTES PRODUCED DURING DECONTAMINATION

Drill Cuttings -- Monitoring Well Construction

Cuttings and drilling fluids will be handled as specified in the monitor well construction specifications. The criteria for designation of cuttings as hazardous are as follows:

TCE	0.5 ppm
DCE	0.02
PCE	0.4
TCA	20

Development Water and Discharge Water -- Monitoring Well

Aquifer water will be discharged to a public sewer system or surface drainage.

Disposal of Rinsate Water Generated by Decontamination Procedures -- Monitoring Well Construction

All rinsate including water captured from hot water spray, methanol rinsate, TSP rinse water, and clean water rinse will be stored in 55-gallon drums or other containers until the hazardous nature of the materials is known. Special care will be taken to

capture any solvent spray or wash water.

These materials will be sampled (one sample per drum) and analyzed using EPA Method 601). Materials above the limits identified above will be managed as hazardous materials and transported off-site within 90 days according to RCRA regulations.

Section 11 - EQUIPMENT CALIBRATION, OPERATION AND MAINTENANCE

The equipment used in collecting field data during the study plan will include a variety of instruments. Proper maintenance, calibration and operation of each instrument will be the responsibility of the MARK field geologist or engineer assigned to the project. All instruments and equipment used during the studies will be maintained, calibrated, and operated according to the manufacturers guidelines and recommendations. At a minimum, all instruments will be inspected and calibrated upon receipt. A photocopy of the manufacturers operation and calibration recommendations will be present with each instrument in the field. In the event that the instrument is not supplied with manufacturers recommendations for calibration and calibration frequencies, the following guidelines will apply:

- All equipment will be calibrated prior to a field program. This includes instruments used to measure water-quality parameters, water levels, well discharge instruments, and air monitoring devices.
- Steel tapes used for well depth should be periodically inspected to check for kinks, stretching, or worn markings.
- Instruments for which calibration cannot be easily checked will be either tested against another calibrated instrument of a similar type, or will be returned to the manufacturer for appropriate calibration. If tested against another instrument capable of making the same measurements, variation between instruments must not

exceed 5%. If readings vary more than 5%, the instrument should be returned to the manufacturer for calibration.

- Instruments that require frequent calibration checks, such as an electric sounder or pH meter, will be calibrated daily during use and after maintenance or repair.

A routine schedule and record of instrument calibration will be maintained throughout the duration of the study. A calibration manual for an electric sounder might include:

- The type of marking used on the sounding wire, i.e., tape ferrules, etc.
- The distance in feet, between each mark and the code to indicate the 100 foot interval.
- The date, name of person(s), results of each calibration check, and pertinent modifications made to the sounder such as adding or removing sounding wire or probes.

Section 12 - Quality Control Procedures for Field Activities

To assure that all data generated is of known quality, the following field quality control methods shall be implemented:

Field Activities

- One duplicate sample for all analytical parameters being sampled will be collected per site per day. A duplicate sample should be taken for every 10 samples or a set less than 10 at each site per sampling day. The duplicate sample will not be labeled as such.
- For water samples only, field blanks (travel blanks) will be included in each travel container for priority pollutant analyses.

Water Level Measurements

Water level measurements will be obtained by utilizing either an electric well sounder or a graduated steel tape. Prior to obtaining measurement data field personnel should check to see that the instrument has been properly calibrated. For proper calibration procedures see Section 11.

At each location and/or time interval, a minimum of two measurements should be taken. The most accurate measurement will be determined by the experienced field technician and recorded in the field notebook or on the appropriate field data form. Data should be recorded to the nearest 0.1 feet.

In addition to replicate measurements, the data should be compared to previous measurements obtained at the well site. If large discrepancies exist from previous measurements which cannot be explained by local ground water activities, changes, or

trends, the equipment should be re-calibrated and the measurements repeated. If possible an alternative instrument should be utilized to verify the accuracy of the data.

Water Quality Parameters (Field Measurements)

Measurements of temperature, pH, and electrical conductance will be performed during each well water sampling event. Prior to obtaining measurement data field personnel should check to see that the instrument is properly calibrated (See Section 11). For pH and electrical conductance reference solutions can be prepared and should be utilized to properly calibrate the instrument.

When obtaining data for water quality parameters, field measurements should be compared with previous data and examined for large variations. If variations greater than 10% exist and cannot be accounted for by changes in field conditions and/or water quality stabilization, the instrument should be recalibrated and the measurements repeated. The most accurate measurement will be determined by the experienced field technician and recorded in the field notebooks or on the appropriate field data form. If possible an alternative measuring device (i.e. another thermometer, pH meter, or electrical conductance meter) should be utilized to verify the data.

Discharge Measurements

Water well discharge measurements will be obtained during each sampling event. For low output water wells capable of being measured utilizing a properly calibrated bucket, quality control can be achieved by performing at least two measurements in

succession to calculate the discharge rate. If variation greater than 10% exists between the replicate measurements additional measurements should be taken. The most accurate measurement will be determined by the experienced field technician and recorded in the field notebook or on the appropriate field data form.

In addition to replicate measurements the data should be compared to previous measurements taken at the well site. If variations between measurements exceed 10% and can not be accounted for by changes in pumping or groundwater yield, the bucket should be recalibrated and the measurement repeated. If possible an alternative measurement device should be utilized to verify the data.

Section 13 - ADWR WELL CONSTRUCTION REPORTING REQUIREMENTS

In order to control the construction of wells and to secure the data generated, the DWR requires the filing of the three following forms:

1. The NOTICE OF INTENTION TO DRILL (DWR-55-40-10/83), shown in Figure 22, is filed prior to any construction and must be signed by the owner or lessee of the property. It supplies such information as the proposed well location, ownership, purpose, description, driller, schedule of abandonment plan, if applicable.
2. The WELL DRILLER REPORT (DWR-55-6-5/83), shown in Figure 23, is filed with the DWR within 30 days following well completion. Recorded on this report is the permit number to drill the well, the well construction specifications and the description of formation material.
3. The COMPLETION REPORT (DWR-55-7-3/84), shown in Figure 24, is filed with the DWR within 30 days following installation of pump equipment by the registered well owner. It supplies information regarding the pumping equipment installed and the results of the well test.

Submission of these forms is required for construction of the monitoring wells proposed in this project. The deep soil borings were also included because they could have encountered the water table and are located in areas potentially contaminated with hazardous organic compounds.

FIGURE 22.

EXPLORATION WELL(S)
FILING FEE $10.00

DEPARTMENT OF WATER RESOURCES (DWR)
NOTICE OF INTENTION TO DRILL
EXPLORATION WELL(S)

EXPLORATION WELL(S)

Section 45-596, Arizona Revised Statutes and Rule R12-15-817 provide: Prior to drilling one or more exploration wells, the well owner, lessee or exploration firm shall file a Notice of Intention to Drill on a form provided by the Department.

WELL/LAND LOCATION

1. Township _____ N/S
   Range _____ E/W
   Section _____

In the case of a single well, list 10-acre subdivision
_____¼, _____¼, _____¼

In the case of multiple wells, list appropriate section(s).

2. County _____

3. Activity Filing Notice:

_____
Name

_____
Address

_____
City State Zip

4. _____
NAME OF CONTACT PERSON

Phone _____

5. Applicant is:

Owner _____
Lessee _____
Firm _____

6. Purpose of well(s) drilled pursuant to this Notice:

Mineral Exploration _____
Cathodic Protection _____
Grounding _____
Monitor _____
Piezometer _____

7. Number of wells in project: _____

8. Owner of land:

_____
Name

_____
Address

_____
City State Zip

9. DESCRIPTION OF WELL:

Diameter _____

Depth / / 100 feet or less

/ / Greater than 100 feet

Type of Casing _____

_____
(If none, so state)

10. Construction will start:

_____
Day Month Year

DO NOT WRITE IN THIS SPACE
OFFICE RECORD

FILE NO. _____
FILED _____ BY _____
INPUT _____ BY _____
DUPLICATE MAILED _____ BY _____
REGISTRATION NO _____
AMA NON EXPANSION AREA _____
W/S S/B

11. For monitoring wells, is pump equipment to be installed? _____

(a) If so, what will be the design pump capacity?

_____ gallons per minute.

(b) What use will be made of the water? _____

_____

_____

12. Driller's name:

_____
Name

_____
Address

_____
City State Zip

_____
DWR License Number

13. Period well will remain in use: _____ months.

14. Proposed method of abandonment of well(s) after project is completed:

_____

_____

_____

_____

_____

GENERAL INSTRUCTIONS

Fill out this form in duplicate and mail to Department of Water Resources, Suite 100, 99 East Virginia, Phoenix, Arizona 85004. Filing fee must accompany Notice.

I state that this Notice is filed in compliance with Rule R12-15-809 and is complete and correct to the best of my knowledge and belief and that I understand the conditions set forth on the reverse side of this form.

DATE _____

_____
Signature

DWR-55-40-10/83

FIGURE 22. (Continued)

CONDITIONS

1. Construction and abandonment standards for all wells shall be in accordance with DWR Rules R12-15-811 and R12-15-816.

2. Drilling of the well(s) shall be completed within one (1) year after the date of Notice.

3. Mineral exploration, cathodic protection or grounding holes of 100 feet of depth or less do not apply to these provisions and do not require filing. More than one 100 foot deep well may be drilled under a single notice for mineral exploration and piezometer purposes. A Project Completion Report for each hole, however, is required within 30 days of completion of the drilling project.

4. Pump equipment may not be installed on wells drilled for mineral exploration, cathodic protection or grounding purposes. If a monitor well is pumped, pumping is limited to the minimum amount required for monitor purposes, but in no case may exceed 35 gallons per minute or an annual amount of 10 acre feet.

FIGURE 23.

STATE OF ARIZONA
DEPARTMENT OF WATER RESOURCES
99 EAST VIRGINIA AVENUE
PHOENIX, ARIZONA 85004

STATE OF ARIZONA — DEPARTMENT OF WATER RESOURCES

WELL DRILLER REPORT

This report should be prepared by the driller in all detail and filed with the Department within 30 days following completion of the well.

1. Owner _____
Name
_____
Address

2. Lessee or Operator _____
Name
_____
Address

3. Driller _____
Name
_____
Address

4. Location of well: _____

5. Permit No. (if issued) _____

DESCRIPTION OF WELL

6. Total depth of hole _____ ft.
7. Type of Casing _____
8. Diameter and length of casing _____ in. from _____ to _____, _____ in. from _____ to _____.
9. Method of sealing at reduction points _____
10. Perforated from _____ to _____, from _____ to _____, from _____ to _____
11. Size of cuts _____ Number of cuts per foot _____
12. If screen was installed: Length _____ ft. Diam _____ in. Type _____
13. Method of construction _____
cable, dug, driven, bored, jetted, etc.
14. Date started _____
Month day Year
15. Date completed _____
Month day Year
16. Depth to water _____ ft. (If flowing well, so state.)
17. Describe point from which depth measurements were made, and give sea-level elevation if available.:
_____
_____
18. If flowing well, state method of flow regulation _____
19. REMARKS: _____

DO NOT WRITE IN THIS SPACE
OFFICE RECORD
Registration No. _____
Received _____ By _____
Entered _____ By _____
File No. _____

(Well log to appear on Reverse side)

DWR-55---5/53

FIGURE 23. (Continued)

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

From (feet)	To (feet)	Description of formation material

I hereby certify that this well was drilled by me (or under my supervison), and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Driller ______________________
Name

____
Address

____
City State Zip

Date ______________________

FIGURE 24

DEPARTMENT OF WATER RESOURCES
99 East Virginia
Phoenix, Arizona 85004

Registration No._____
Owner of Well Site_____
File No._____

COMPLETION REPORT

1. Per A.R.S. §45-600, the Completion Report to be filed with the Department within 30 days after installation of pump equipment by the registered well owner.
2. Drawdown of the water level for a non-flowing well should be measured in feet after not less than 4 hours of continuous operation and while still in operation and for a flowing well the shut-in pressure should be measured in feet above the land or in pounds per square inch at the land surface.
3. The static groundwater level should be measured in feet from the land surface immediately prior to the well capacity test.
4. The tested pumping capacity of the well in gallons per minute for a non-flowing well should be determined by measuring the discharge of the pump after continuous operation for at least 4 hours and for a flowing well by measuring the natural flow at the land surface.

LOCATION OF THE WELL:

_____ _____ _____ ¼ ¼ ¼
Township Range Section

EQUIPMENT INSTALLED:

Kind of pump_____
Turbine, centrifugal, etc.

Kind of power_____ H.P. Rating of Motor_____
Electric, natural gas, gasoline, etc.

Pumping Capacity_____ Date installed_____
Gallons per minute

WELL TEST:

Test pumping capacity_____ Date Well Tested_____
Gallons per minute

Method of Discharge Measurement_____
Weir, orifice, current meter, etc.

Static Groundwater Level_____ft. Drawdown_____ft.

Total Pumping Lift_____ft. Drawdown_____lbs
(Flowing Well)

I HEREBY CERTIFY that the above statements are true to the best of my knowledge and belief.

_____, 19___ _____
DATE Signature

_____
Address

_____
City State Zip

DWR-55-7-3/84

ATTACHMENT D

INTENTIONALLY OMITTED

ATTACMENT E

DEC 8 1988

ASSIGNMENT OF INTEREST AND ASSUMPTION
OF LIABILITIES

This Assignment of Interest and Assumption of Liabilities ("Assignment") is entered into this _____ day of _____, 1988 by and between the City of Scottsdale, a municipal corporation of the State of Arizona ("City"), CH2M HILL, an Arizona corporation, a contractor to the United States Environmental Protection Agency, the United States Environmental Protection Agency ("EPA"), and Beckman Instruments, Inc., a Delaware corporation ("Beckman").

RECITALS

WHEREAS, the City, CH2M HILL, and EPA entered into a license agreement dated May 16, 1988 ("License Agreement"), attached hereto as Exhibit A and incorporated by reference, wherein the City granted EPA, CH2M HILL, and CH2M HILL's subcontractors a license to drill four additional monitoring wells at two sites located within the Indian Bend Wash area in Scottsdale; and

WHEREAS, EPA now desires one of the four monitoring wells identified in the License Agreement to be drilled by Beckman; and

WHEREAS, CH2M HILL desires to assign to Beckman its interests and obligations under the License Agreement as they apply to one well to be designated herein; and

WHEREAS, Beckman desires to acquire CH2M HILL's interest and assume Beckman's obligations under the License Agreement as they apply to the one well to be designated herein; and

WHEREAS, EPA desires to change the location of the well designated as site "O" in the License Agreement to the following new location:

7913 E. McKinley Street, well to be drilled at curb line;

FOR VALUABLE CONSIDERATION, it is agreed as follows:

1. CH2M HILL transfers and assigns to Beckman its interests and obligations under the License Agreement as they apply to the well to be drilled at site O.

2. Beckman assumes and agrees to be bound by all of CH2M HILL's liabilities and obligations pursuant to the License Agreement and agrees to perform and observe all the covenants and conditions contained therein with respect to the drilling of the well at site O.

3. EPA approves of this Assignment.

4. The City of Scottsdale approves of this Assignment.

5. Nothing in this Assignment shall be construed in any way as modifying or affecting any of the other terms, covenants, conditions or agreements contained in the License Agreement.

6. This Assignment shall inure to the benefit of and shall be binding upon the parties hereto and their respective successors and assigns.

IN WITNESS WHEREOF the parties hereto have executed this Assignment as of the date and year first written above.

CITY OF SCOTTSDALE
a municipal corporation

By:_____
Leonard L.Dueker, General Manager
Water Resources Department

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

By:_____
Jeff Rosenbloom, RPM

CH2M HILL, an Arizona Corporation

By:_____
Michael D. Smith, Division Manager

BECKMAN INSTRUMENTS, INC.

By:_____
Its_____

REVIEWED BY:

_____
Thomas J. Wilson, City Attorney

CITY CONTRACT ADMINISTRATOR

_____
Jim Nelson, Water Quality Coordinator

Contract No. 870368

LICENSE AGREEMENT

This LICENSE AGREEMENT entered into this 16th day of May, 1988, by and between the City of Scottsdale, a municipal corporation of the State of Arizona, (City) and CH2M HILL, an Arizona corporation, a Contractor to the United States Environmental Protection Agency, and the United States Environmental Protection Agency (EPA).

RECITALS:

WHEREAS, the groundwater located beneath the Indian Bend Wash (IBW) area in Scottsdale has been contaminated by industrial chemicals; and

WHEREAS, the site has been selected as an EPA superfund site; and

WHEREAS, the area is currently under investigation by EPA, state and local governments; and

WHEREAS, the EPA desires to drill four additional monitoring wells, one of which must be located in a city right-of-way; and

WHEREAS, the City desires to cooperate with EPA in the investigation and clean-up of the IBW; and

WHEREAS, EPA has contracted with CH2M HILL to investigate groundwater contamination in the vicinity of the site;

NOW THEREFORE, IN CONSIDERATION of the mutual covenants and agreements contained herein, the parties hereto agree as follows:

1. City hereby grants EPA, CH2M HILL, and CH2M HILL's subcontractors a license to drill four (4) additional monitoring wells at two (2) sites located within the City and described as follows:

> One Upper Alluvial Unit well at site "O" located on East Beatrice Street between house numbers 7838 and 7844 to a depth of about 125 feet.
>
> Two wells at site "E" (one Lower Alluvium and one Middle Alluvium Unit) located adjacent to the present E-5UA well in Vista del Camino Park, one to a depth of about 300 feet and the second to a depth of about 700 feet.
>
> One Middle Alluvium Unit well at site "D" located adjacent to the present B-J well to a depth of about 300 feet.

EXHIBIT "A"

2. City shall allow EPA, CH2M HILL,and CH2M HILL's subcontractors to install instrumentation to monitor contaminants and water levels in the completed wells, for a period of five (5) years from the date of completion. At the end of this five (5) year period, the City may extend the monitoring period for an additional five (5) years. At the end of either period, EPA shall, at the City's discretion, either seal the wells in compliance with applicable state regulations or turn wells and equipment over to the City.

3. CH2M HILL agrees to restore any damage to the property.

4. CH2M HILL agrees to provide the City with a certificate of insurance in the amount of one million dollars ($1,000,000.00), with the City named as additional insured. CH2M HILL agrees that each of its drilling subcontractors will provide the City with a certificate of insurance in the amount of at least ten million dollars ($10,000,000.00), with the City named as an additional insured.

5. The City shall have no duty, actual or implied, to provide sites which are suitable or appropriate for drilling, nor does the City in any way warrant the condition of any of the sites.

6. EPA and CH2M HILL agree that drilling activity will occur only between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday. Drilling sites will be temporarily fenced ~~and~~ or guarded when left unattended.

7. EPA agrees that once completed, wells will be covered with an appropriate, locking, highway approved cover.

8. EPA and/or CH2M HILL shall make arrangements at each site for disposal of well testing and sample water. This disposal must be approved by the City prior to discharge.

IN WITNESS WHEREOF, the City of Scottsdale by its Mayor and City Clerk have hereunto subscribed their name this 16th day of May, 1988.

ATTEST:

City Clerk

By: _____
Deputy City Clerk

CITY OF SCOTTSDALE

By: _____
Herbert R. Drinkwater, Mayor

United States Environmental Protection Agency

By: _____
Jeff Rosenbloom, R.P.M.

CH2M HILL

By: _____
MICHAEL A Smith
DIVISION ~~Engineer~~ Manager

Reviewed:

_____
Sandy Spain, Purchasing Director

_____
George Wendt, Risk Management

_____
Thomas J. Wilson, City Attorney

CITY CONTRACT ADMINISTRATOR

By: _____
Jim Nelson, Water Quality Coordinator